2749

GREATER TORONTO AREA 3Rs ANALYSIS

SERVICE TECHNICAL APPENDIX - SCHEDULES

DRAFT - NOVEMBER 1993

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for
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Ministry of Environment and Energy

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List of Schedules
Service Technical Appendix

SCHEDULE A

POTENTIAL WASTE DIVERSION IMPACTS OF SECONDARY ENHANCEMENT COMPONENTS

SCHEDULE A

Potential Waste Diversion Impacts of Secondary Enhancement Components

Table 2.3 of the Technical Appendix for Service, (Table 7.3 of the EA Input Document) provides an estimate of waste diversion that may be achieved through addition of the short and long term secondary enhancement components to any of the 6 residential or IC&I waste diversion systems. The following provides a brief rationale for the estimates presented in Chapter 2.

1.6 Landfill Ban on Leaf and Yard Wastes to Force Increased Management on Residential Property

Waste composition estimates indicate that 2% to 11% (Halton 2%, Metro 4.6%, York 7.6%, Peel 10.9%, Durham 11%) of residential waste, and 1% of IC&I waste disposed in 1992 was leaf and yard waste. Most of this would be diverted if a leaf and yard waste ban was imposed.

1.7 Eliminate Pick-up for Leaf and Yard Waste

A portion of the 2 to 11% of residential waste which was leaf and yard waste, and was disposed in 1992 could be diverted.

1.8 Increase use of Refillable/Reusable Packaging and Products

Disposable packaging is 25% of residential waste, and an assumed 25% of IC&I waste (Franklin, 1988). Increased use of refillables and reusable packaging should be able to provide every package with at least 10-30 uses prior to requiring disposal. Assume at least 20% of current disposable packaging (i.e. 5% of the residential waste stream) can be replaced in this way, and that each refillable/reusable package has 20 journeys/reuses. However, reusable and refillable packaging is often heavier than disposable packaging, (twice the weight was assumed for this analysis). Therefore, when disposed (after 20 refills) the container weight is heavier, for a net reduction in the disposed weight of 90%. Therefore, the portion of the residential waste stream impacted by this change (5%) is reduced by 90%, for an overall reduction of 4.5% of residential waste.

1.9 Landfill Bans on Recyclable Materials

Landfill bans currently exist in GTA on many recyclables generated by IC&I sources. Most of the gains with a blanket landfill ban policy would be made through increased diversion of residential waste.

For this assessment it is assumed that recyclable material includes: ONP, OCC, glass, steel, aluminum, PET, HDPE, LDPE and half of bulky goods. Residential waste composition shows that 25% of the waste stream disposed consists of these materials. It is assumed that a landfill ban would probably divert 70% of the targetted materials, therefore this would result in diversion of 17.5% (25% x .7) of residential waste.

1.10 Waste Reduction Planning Requirements for Construction/Demolition Projects

Waste reduction planning requirements for C&D projects would force C&D companies to consider 3Rs as part of each project. The requirement to specify that recycled content material was used in construction would increase awareness of the availability of these materials, and be likely to strengthen markets. The benefits of this policy would be felt over the longer term, as awareness of 3Rs options increase among all levels of the industry. A detailed estimate of the potential diversion impacts of this policy cannot be developed in the absence of exact requirements. For this analysis it is considered reasonable to assume that this policy would achieve at least 10% diversion of C&D waste.

1.11 Procurement ordinances (favouring durable products, recycled content and/or reusable purchases)

Governments (including Metro Toronto and the City of Toronto) have implemented schemes that incorporate the use of recyclable and recycled materials, and durable and reusable products (such as price preference for designated recycled or reusable products, specifications that contractors use these products etc.). Two examples include GIPPER, (Governments Incorporating Procurement Policies to Eliminate Refuse at the provincial and municipal level) and the Peel Region HOW (Help on Waste) program. Procurement ordinances reduce waste and support 3Rs activities by driving markets for recycled products. At this time, exact impacts on local waste streams (such as in the GTA) can not be identified.

1.15 Promotion/education program for consumers focusing on purchasing habit changes to minimize waste generation (for example bulk buying, borrowing items, buying products in recyclable packaging etc.)

This component would reduce waste by focusing on diversion of products that are usable at the time of disposal, but no longer desired by the current owner. It encourages an attitude change, and promotes "the conserver society". Individual initiatives may reduce small portions of the waste stream, however in aggregate, this initiative is likely to create attitude change and increase diversion through reuse. Disposable packaging waste is 25% of the residential waste stream. A focus on reusable packaging would lower this total. Textiles and durable goods (such as furniture, appliances etc.) are two items that are increasingly reused. They contribute a combined total of 4 to 8% of the disposed residential waste stream. Promotion of re-use of these (by social service agencies, etc.) will lower their contribution to the waste stream.

1.16 Product redesign for increased product life and durability

The rate of disposal and replacement of existing goods is slowed by extending product life and durability of goods resulting in decreased quantities of waste disposed. No studies presenting accurate estimates of quantities or percent

weight reduction are currently available. However, several companies are presently engaging in R&D to lengthen the lifespan of the products they create. Durable goods contribute 1 to 4% of the disposed residential waste stream. This could be decreased if product life is lengthened.

1.17 Packaging redesign to reduce quantity and weight

Packaging constitutes 25% of residential and an assumed 25% of IC&I waste. Packaging reduction is recommended as a voluntary means of source reduction through NAPP, and is mandated for certain sectors by the Ontario 3Rs regulations.

Packaging redesign involves reviewing current packaging formats and substituting materials that are smaller or of a lighter weight. It incorporates utilization of recycled materials in new packaging formats, to reduce the use of virgin materials. McDonald's Restaurants have also been active in lightweighting packaging wraps. Many other companies have been redesigning packaging and products to incorporate recycled materials, such as Rubbermaid, (using secondary LDPE stretch film for plastic and rubber products) and Proctor & Gamble and Lever Brothers (using recycled boxboard in detergent board boxes) (Faulkner, 1993). Kraft General Foods Canada achieved a 20% reduction with downgauging and lightweighting, but like other companies, will need to incorporate full packaging and packaging concept redesign to achieve further reductions (Faulkner, 1993).

As an example, if improvements through packaging redesign could be applied to 20% of packaging waste (5% of the overall waste stream) and achieve 30% weight reduction, this would result in a net 1.5% diversion increment.

1.19 Deposit/Refund Systems for a Variety of Materials

Deposit/refund systems provide an economic incentive for consumers to return rather than dispose of the materials on which the deposit was paid. Ontario's Brewers Retail is a well known example of a successful deposit-refund system, with reported recovery rates of 94%. Jurisdictions which impose deposits or levies on materials such as lead acid batteries or tires also report high recoveries.

Recoveries of many metal, glass and plastic containers are currently reported at 70-90% (Barrie MORE project, Quinte) through established Blue Box programs. Assuming that a deposit system would get 90% recovery of all glass, steel, aluminum and plastic food and beverage containers, incremental diversion would be 20% (90-70%=20%) of the portion of the waste stream (8-10%) which are food and beverage containers, i.e. a diversion increment of 8-10% x 0.2 = 1.6-2%.

1.20 Hold community source reduction workshops

Twenty-five families in Maxville-Kenyon, Ontario attended a source reduction workshop and were taught how to reduce waste (through selective purchasing, backyard composting etc.). During the one year monitoring program, their overall waste was reduced by 42% or more, while average dry waste decreased by 34%. Wet waste was reduced by 66% through backyard composting. A diversion increment that can be specifically attributed to the workshop has not been quantified.

1.21 Develop "Pre-cycling" Campaign

Precycling is a component that would increase consumer awareness about ways to minimize waste generation through effective changes to shopping, purchasing behaviour and attitudes (including in-store promotion and educational programs, school educational programs and a media launch). A study conducted in Boulder, Colorado, estimated that 3% reduction of the total waste stream was achieved by a pre-cycling campaign.

1.24 Develop Infrastructure for Distribution of High Quality Food from Catering Facilities (e.g. Second Harvest)

Food waste constitutes approximately 7% of IC&I waste. A portion of this could be diverted for human consumption (i.e. through food banks, soup kitchens etc) or, if this is not viable, for consumption as animal feed. The establishment of a central food waste management organization would help develop a network to facilitate direction of food waste by retailers and manufacturers to appropriate end users. The exact incremental diversion that could be attributed to this component would depend on the type of organization established and potential end uses for the product. At this time, the impact of this component has not been measured. However assuming that 10% of IC&I food waste could be diverted, this results in diversion of 0.7% of the IC&I stream. If IC&I waste is 60% of the total waste stream, this component might divert 0.4% of the total waste stream.

1.28 Provide Neighbourhood Leaf Shredders in Fall

Leaf and yard waste constitutes 2% to 11% of the residential waste stream disposed in GTA in 1992. (Durham 11%, Halton 2%, Metro 4.6%, Peel 10.9%, York 7.6%). Of this total 25% is leaf waste, and 75% is yard waste. Providing leaf shredders would decrease the bulk (and increase the density) of leaf wastes. It would contribute to increased diversion by providing more options for management of leaf waste. Assuming that this measure would help divert half of the remaining leaf waste, the diversion increment would be 0.25 to 1.4% of the residential waste stream (2% x .5 x .25 = 0.25%, 11% x 0.5 x 0.25 = 1.4%).

2.5 and 2.13 Collection of all dry recyclables and household organics in a 4-stream wet/dry collection system

Performance of a 4-stream wet/dry system should be similar to a three-stream system, where overall waste diversion is typically around 60%.

6.1 Centralized windrow composting of source separated organics

This technology would be an alternative approach (to in-vessel processing) to composting source separated organics collected from both the residential and IC&I sector by a number of systems considered. Organic wastes make up approximately 30% of residential waste, and 9% of IC&I wastes, therefore this technology would contribute to diversion of this stream. The potential to compost source separated organics successfully, without odour problems is being tested at a number of sites at this time (e.g. Mississauga).

6.9 Use Centralized Anaerobic Digesters

Central anaerobic digestion is a processing method which can be used for organic wastes (residential and IC&I) after they have been collected from source. It could replace, or be used in addition to central (aerobic) in-vessel or windrow composting plants.

8.5 Use State-of-the-Art Technologies and Techniques

Using state of the art technology and approaches is an important feature of all 3Rs systems. The impacts on waste diversion which are linked with specific technologies can only be estimated when the particular technique/technology is identified. It is assumed that state of the art approaches will always improve on the status quo. Each technique or technology either improve diversion or system efficiency in some way. This component is therefore a benefit to the diversion system, with diversion achievements quantifiable on a case-by-case basis only.

10.1 No Unprocessed Waste to Landfill (Residential)

This approach can be accomplished in a number of ways. For residential waste, it can be accomplished by retaining source separation programs currently in place (which divert 19 to 35% of the residential waste stream) and adding a mixed waste processing and composting step for all remaining residential waste. Estimates (presented later in the technical appendix) show that an estimated 70 to 80% diversion of residential waste is achievable through this approach. If this policy were applied to IC&I waste, it is estimated to divert up to 80% of the IC&I waste stream.

10.2 Mandatory Source Separation by Residential Sector

The Region of Halton implemented a mandatory source separation by-law which resulted in a reported 20% increase in the quantities of material collected through source separation programs. It is assumed that the same impact would be experienced in other GTA municipalities, if this approach were adopted.

10.5 Require municipalities in GTA to achieve designated diversion targets

A waste diversion target can provide a focused requirement for achieving waste diversion. Assuming establishment of reasonable targets, with adequate

collection, processing and market development for materials, this component would contribute to increased waste diversion.

10.6 Require municipalities in GTA to establish effective waste generation and diversion monitoring systems

By providing good information about waste generation and diversion, strengths and weaknesses of existing waste management systems can be identified. This provides the required information for adequate system design which should contribute to increased diversion of waste.

11.4 Allow residences to refuse delivery of unwanted junk mail

Unaddressed/unsolicited junk mail contributes to approximately 87lb/hh/year (estimated by Recycling Council of Ontario) which converts to 15 kg/cap/year, based on an assumption of 2.6 persons/household. This equates to 3.3 to 4.6% of the residential waste stream. A portion of this is likely recycled by householders. However, assuming assistance by all residents and junk mail distributers (including Canada Post), to reduce junk mail by 50%, total reduction could contribute to diversion of 1.6 to 2.3% of residential waste.

11.5 Reject loads with visible designated materials

Several municipalities have implemented a practice of rejecting (or surcharging) loads with visible designated materials. This component provides an incentive to proper source separation of materials that should result in increased waste diversion. Direct impacts that can be attributed to this measure have not been quantified.

11.6 Develop landfill management practices which utilize disposed waste as cover material

This component would focus primarily on some IC&I wastes which have reasonably uniform consistency, and may include materials such as foundry sand, shredder fluff and similar materials. Rather than be disposed in the landfill, they would be source separated and used as daily cover, thus eliminating the need to use borrow material for this purpose. This approach also increases landfill life by putting waste material to a beneficial use. Cover material typically occupies up to 20% of a landfills capacity and this could save a portion of landfill capacity typically occupied by cover material

11.7 Produce compost on-site for landfill cover and preserve capacity

Wet (organic materials, including leaf and yard and household kitchen wastes) would be collected separately and composted at the landfill site (or at a separate composting facility). Compost produced would not have to achieve top quality standards, as it would be used immediately as daily cover on the landfill, replacing the need for a borrow material. This component has the benefit of developing a ready market for "inferior" compost and producing a cover material that is easily revegetated. This use of organic materials could divert

quantities similar to central composting and preserve landfill capacity by displacing borrow material with material which would otherwise have been disposed as waste.

11.8 Volume based disposal fees

At present, disposal fees are usually based on weight of materials disposed. A switch to volume based disposal fees is likely to provide an incentive to decreased disposal of materials which are bulky and of greater volume but for which disposal is based on weight. The exact impact of the component is linked with the exact fees chosen.

13.3 Grant programs to support source reduction in residential sector

Grant programs can be developed to encourage development of community programs to support waste reduction in the residential sector. Grants may be applied to promotion and education programs, developing local waste exchange initiatives etc. The grants act as an incentive to community action, and can lead to increased waste diversion. However, it is difficult to measure the direct impacts of this type of program, and information on the incremental waste diversion impact is not available at this time.

13.4 Full cost accounting forcing municipalities to charge the full or total cost of waste management

This component would remove any subsidies of waste disposal at the municipal and residential level. Residents would be aware of the full cost of waste disposal (through itemized tax bills etc). Tipping fees would reflect the true cost of waste disposal. If the cost of disposal is greater than the cost of waste diversion, this component may therefore provide increased incentives to diversion. However, in GTA, costs of disposal are presently between $80 and $90/tonne and this is likely close to the true cost of disposal and the actual impact of the policy would be limited.

14.1 Integrate waste diversion with economic development programs to create markets for secondary materials

Developing markets for secondary materials is a key issue in waste diversion. If adequate markets are not available, materials must be warehoused (if not landfilled), which reduces the cost-effectiveness and overall waste reduction effects of the program. Creating local markets for secondary materials will stabilize demand, and provide sustainability to programs. However, many local market development programs are small rather than large scale. At this time, the direct impacts of this measure on local diversion have not been measured.

14.2 Mandate product stewardship with requirements for market development

Market development is an essential element of a full scale product stewardship program. The German Green Dot program is experiencing severe market related problems at this time, partially due to inadequate market development efforts prior to the program launch. Overall recovery targets for sales packaging materials were set at 72% diversion each for glass, tin and aluminum, and 64% diversion each for cardboard, paper, plastic and composites by weight. These targets require collection of 80% of materials available (by weight) and sorting of 90% of the collected quantities (Warmer Bulletin, May 1993). These targets are to be met by July 1995 and include marketing of materials. To date, in Germany, overall diversion has been limited to approximately 30% of materials recovered, with the remaining 70% being landfilled (Saul, May 1993). This problem results from inadequate market structure for recovered materials, high system costs (that were inadequately predicted) and confusion with division of collection responsibilities (between the municipal and private sectors).

Over time, with careful attention to details, it is expected that this component could result in recovery of 80% to 90% of packaging (25% of residential waste), thereby contributing to diversion of 20% of residential waste (all dry material). Some of this material is currently diverted through existing programs (BioCycle, June, 1993).

15.1 Expand Blue Box system to cover all IC&I facilities who want to participate, with focus on institutional and commercial

Currently, in various municipalities (e.g. Metro Toronto) some small IC&I generators (restaurants etc.) are incorporated in Blue Box collection systems. By providing a convenient service to more IC&I facilities, waste diversion is increased. Expanding this service to a wider range of institutional and commercial facilities would avoid the need for identifying and organizing alternative collection systems for recyclable materials. By providing a convenient opportunity to recycle to more IC&I generators, waste diversion from this sector would increase. The impact of this measure would depend on the number and type of generators that would receive this service.

15.2 Provision of bins at major IC&I facilities (e.g. hospitals, schools, shopping malls etc.)

Providing recycling bins at IC&I facilities would increase convenience of waste diversion at IC&I facilities and help promote recycling in this sector. Specific impacts would be linked with the number and types of facilities providing bins and their subsequent use of the infrastructure. Impacts of this component would depend on the number of facilities involved.

15.8 Short term (3 to 6 month) storage of IC&I materials to take advantage of emerging technologies and/or market prices
Component provides protection against poor market prices for secondary materials by providing the opportunity to store materials and capitalize on prices as they increase. This removes a possible economic disincentive to waste diversion and is likely to contribute indirectly to increased waste diversion. Specific impacts of the component depend on the materials involved, and for that reason, at this time, no specific diversion impact is estimated.

16.5 Use centralized anaerobic digesters
See comment on 6.9

19.5 Replace collection and processing equipment and approach with state-of-the-art technology world wide (from Japan, Germany etc.)
See comment on 8.5

20.5 Require retailers and/or producers to establish recovery systems for designated products and packaging
Packaging constitutes approximately 25% of residential waste (Franklin, 1988). Packaging reduction is recommended as a voluntary means of source reduction through NAPP, and is mandated for certain sectors by the Ontario 3Rs regulations. Packaging recovery systems are being established or are under consideration in a number of jurisdictions.

See comments on 14.2.

20.6 Deposit/refund system for soft drink containers
By imposing a deposit/refund system on soft drink containers, an immediate incentive to waste diversion is provided at the consumer level, which can contribute to high recovery of the materials involved. If applied to beverage containers (which constitute 2% of the residential waste stream), the incremental diversion associated with this component would be 0.4% of the residential waste stream, assuming that 70-90% of these containers are currently recovered through Blue Box programs, and that a deposit/refund system would increase recovery to over 90%.

See comments on 1.19

20.8 Mandatory recovery rates and targets for specific materials
This component involves government (usually at the provincial level) mandating a specific recovery rate for designated materials. This approach has been used in a number of jurisdictions. It further involves developing the adequate infrastructure to support recovery of the materials and ensuring public participation in the scheme. Should these conditions be met, this component increases waste diversion, with specific impacts of the component dependent on the recovery rates established and on the materials that are mandated.

20.16 Mandated levies or taxes to support 3Rs
A levy or tax placed on designated materials is expected to a have a dual benefit. First, it could be applied against any material (such as the use of virgin newsprint) to help encourage resource efficiency and stimulate demand for recycled materials. Secondly, it could provide a pool of funds to expand or support existing or developing recycling programs and infrastructure. A levy or tax in support of 3Rs programs would therefore contribute to waste diversion. The exact impact would be quantified by identifying levy or tax targets and potential uses of funds generated.

21.1 Change approval process to require new IC&I facilities to design for reduction and re-use
Regulations would be required mandating development of reduction and re-use plans prior to approval of new IC&I facilities. Plans would be submitted to authorities prior to obtaining approval for new facilities. Waste diversion would be increased by planning in advance for reduction and re-use in facilities (providing adequate space etc.)

21.2 Establishment of central food waste management organization
See comment on 1.24.

21.3 Allow locations to refuse delivery of unwanted "junk mail"
Unaddressed/unsolicited junk mail contributes a sizable portion of mail received in IC&I locations annually. By permitting or assisting IC&I facilities to refuse delivery of junk mail, waste would be reduced at source, contributing to waste diversion. The specific impact of this component on IC&I waste has not been measured. The percentage of IC&I waste which is junk mail is not known.

21.4 Develop and implement a material use guideline
Development of a material use guideline covers a number of different activities and materials (such as a guideline on appropriate materials to use as backfill, potential uses for various waste materials etc.). The direct effects of this component would depend on the materials involved, and current management practices.

22.4 Establish databank on waste reduction technologies and system design
Using up to date technology and system design is an important feature of all 3Rs systems, contributing to efficiency and a high quality of secondary materials. Establishing a databank on waste reduction technologies and system design would contribute to waste diversion indirectly by ensuring that information on the most appropriate technologies is available.

23.4 Self-imposed levies by producers to promote 3Rs
Voluntary "product stewardship" initiatives have been launched in several sectors (e.g. Black & Decker has instituted a $5 rebate to customers who return old appliances or tools for recycling) (Creed, April, 1993). The most famous such program is the German Green Dot program where companies formed a corporation to set and administer levies designed to finance development of a nation-wide recycling infrastructure for all consumer products.

Such levies can take any number of forms, and can be applied at any level, and on any product or group of products. The impact of this component cannot be measured without details of a specific program. The component would contribute to waste diversion by providing opportunities for recycling, potential incentives to consumers to recycle or through support of 3Rs initiatives through market development.

23.4 Funding and incentives to recycling industries and other industries that utilize secondary materials
By providing funding and incentives to recycling industries and others to support utilization of secondary materials, market development would be supported. This would indirectly lead to increased diversion by promoting existing and potentially expanding new markets for secondary materials. Impacts on waste diversion are linked with levels of funding, targets and materials supported.

24.2 Funding incentives to product manufacturers to utilize secondary materials
Funding incentives would support market development for secondary materials, stabilize markets for secondary materials, and possibly lead to increased waste diversion.

24.6 Purchasing specifications to promote recycled content
Companies that develop purchasing specifications promoting recycled content contribute to waste diversion through market development. Several companies are moving into this area. For example, Rubbermaid utilizes secondary LDPE stretch film for plastic and rubber products, and Proctor & Gamble and Lever Brothers use recycled boxboard in detergent board boxes (Faulkner, September 1993). This component contributes indirectly to waste diversion. Given competitive prices and a high quality of secondary materials, it is expected that companies will increasingly incorporate recycled materials in their purchasing specifications and waste diversion programs will have stable markets for processed materials and will continue to increase as a result.

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SCHEDULE B

ON-SITE COMPOSTING

SCHEDULE B
On-Site Composting

Introduction

Composting refers to the process by which organic materials such as food, yard waste, wood, etc. are transformed into a stable end product referred to as compost or humus. Two primary types of composting are available. These include:

- On-site composting
  —backyard composting
  —vermicomposting
  —multi-family/community composting
  —mid-scale on-site; and

- Centralized composting
  —centralized windrow (leaf and yard)
  —centralized in-vessel.

This schedule focuses on on-site composting mechanisms that are utilized in residential and IC&I waste diversion systems.

Backyard Composting

Backyard composters allow householders to carry out this process on their own property, thus decreasing the quantity of waste that must be managed at the curb. Materials which are most commonly composted in backyard composters include yard waste, leaves, grass clippings, food waste, fruit and vegetable waste from the kitchen and, depending on the type of composter used, animal and dairy waste.

The backyard composting process generally requires placing wastes in a covered container, keeping the contents moist and well aerated. Watering, turning and adding dirt and some yard waste are required periodically. Various types of containers are available commercially or can be made with simple materials. Different designs facilitate aeration or limit possible problems. There are also digester/composters which employ an anaerobic process (absence of oxygen). Vermicomposters which use worms to break down organic waste are suitable for indoor use and for households such as apartments with limited space and low or zero generation of yard waste.

Although backyard composting is a relatively low-tech method for handling significant quantities of organic wastes, the potential impact of this method on reducing the waste stream to be disposed is now being recognized.

There are several advantages to backyard composting including the following:

- the amount of organic matter collected at the curbside is reduced, resulting in savings in transport, processing and disposal costs;

- there is a usable end product for participants which can decrease spending on fertilizers and soil conditioners;

- The process is low-tech and inexpensive in relation to other waste reduction and processing options;

- It presents a good opportunity for increasing public awareness and understanding of waste management issues;

- It offers a simple opportunity for individuals to get involved in waste management.

There are several factors to be considered in establishing backyard composting programs, including:

- the municipality's desired level of involvement in promotion, education, support, cost sharing and in distribution of composters;

- homeowner level of commitment to altering routines. Composting requires an individual to change waste management behaviour from putting waste in the garbage to actually source separating selected organic materials;

- the choice of composter, determined in part by the specific needs of the municipality and preferences of residents. For example, some composters only handle vegetable matter. Also, yard wastes may overwhelm composter capacity;

- the specific situation of multi-family dwellings. Greater effort may be required by residents and, they may not benefit directly from use of the end product. A recent study of a demonstration project in Waterloo reported positive results, particularly with townhouse complexes. Suggestions for successful programs included, a strong educational program, compatibility with existing garbage/recycling programs, and flexibility and a personalized approach, as multi-unit dwellings have varying populations and site characteristics.

Components of a Backyard Composting Program

Various options and success factors should be considered in implementing a backyard composting program. These include:

- selling or providing compost units. Some communities have provided compost units free of charge while others have charged a nominal fee. Participation in programs using either method has been high. From surveys it appears that people are prepared to pay for composters although some subsidy is required (Compost Management, 1992a, BioCycle, 1993, Maclaren, 1990, Composter's Journal, 1992, Kirkby, 1992);

- distributing compost units. Some communities have delivered units to residents while others have made the units available for collection. Both methods appear to have achieved high participation. The highest participation rates have been achieved in programs in which there was door-to-door distribution of compost units (Compost Management, 1992a, BioCycle, 1993, Maclaren, 1990, Composter's Journal, 1992, Kirkby, 1992);

- forcing increased use of composters by imposing bans or limitations on certain materials being sent to landfill. These could include bans on leaves or grass. Various communities, including Waterloo, Kitchener and Woolich have implemented such bans. Also, two communities in Halton have recently banned the disposal of grass in landfills;

- promoting backyard composting through various media such as "how-to" brochures, posters, public transit ads, newspaper ads, radio ads etc.;

- publishing written on-going education materials such as newsletters and brochures;

- providing training and outreach programs including the training of volunteers, permanent displays, periodic workshops and seminars. An example is the Master Composter Program in Toronto. This is funded partially by the Ontario Ministry of the Environment and Energy and coordinated by the Recycling Council of Ontario. It involves a comprehensive 40-hour training program for volunteers including instruction in composting theory, choice of composting bins, troubleshooting, use of finished compost, effective public promotion and education techniques. Volunteers agree to provide 40 hours of community extension for which they are provided training materials such as displays and literature;

- implementation of a grasscycling program which could be established in conjunction with a backyard composting program. This involves leaving grass clippings on the lawn. It is an environmentally sound method of handling some lawn waste in the backyard rather than requiring municipal collection and processing.

Experience with Backyard Composting Programs

Many districts and municipalities throughout Ontario have established backyard composting programs and have reported positive results (Compost Management, 1990, Compost Management, 1992a, BioCycle, 1993, Maclaren, 1990, Composter's Journal, 1992, RIS and H. Sutcliffe, 1993). A summary of information about backyard composting programs is presented in Table B.1. All GTA regions are actively involved in promoting and supporting the use of backyard composters.

All have included the provision of free or subsidized compost or digester units. Some were distributed door-to-door while others were made available for pick-up.

Participation

Voluntary participation in backyard composting activities conventionally is considered to level at between 20 and 30 percent of households in Ontario communities. Milton currently has distributed composters to around 22% to 23% of households with minimal promotion and education (Pantonio, 1993). However, other municipalities have realized significantly higher participation rates (RIS and H. Sutcliffe. 1993, BioCycle, 1993). This is generally due to greater efforts at promotion and distribution. For example, Milton reports little or no promotion or education programs. In contrast, the Central and South Hastings Waste Management Board has achieved almost 80% householder uptake of backyard composters in its 15 municipalities with an aggressive door-to-door distribution program (RIS and H. Sutcliffe. 1993, BioCycle, 1993, Kirkby, 1992).

In other pilot projects with a strong promotional component, acceptance of composters generally has been high, ranging from 75% in Durham (Compost Management Associates Ltd., 1992a, 1993), to 84% in Waterloo (Waterloo, 1992). Even in those programs which charged a nominal fee (e.g. Waterloo, Metro Toronto), acceptance was high (Waterloo, 1992, Maclaren, 1990, Ferguson, 1993). In Pickering, there was initially only 9.5% acceptance when a brochure, delivered to homes, was used to promote interest in trying a backyard composter. However, two later campaigns with door-to-door promotion and delivery achieved significantly higher acceptance - 74%.

Subsidizing the cost of composters to residents appears to encourage participation. 82% of respondents to an initial survey in Metro Toronto said they would not have purchased a composter if it had not been offered at a subsidized price (Maclaren, 1990), whereas in Pickering, where composters were provided free of charge, 80% of those surveyed said they would have been willing to pay for the composter at a subsidized price (Compost Management, 1992a).

The 1992 survey of residents in Metro Toronto who accepted a composter from the City over the previous three years in indicated a high on-going participation rate. Of those who responded to the survey (60%), 98% were still using their composter (Ferguson, 1993). In the Waterloo program, 82% of households in the pilot area accepted composters and after 11 months, 97% of those responding to the survey (36%), were still using them (Waterloo, 1992). In Pickering, after an initial acceptance of composters of 74% during the first year, participation had fallen to 78% of those accepting a unit (58% of the pilot households) (Compost Management, 1992a).

Waste Diversion Rates Achieved

Reported diversion rates vary from 13% to 32% of the residential waste stream in a sample of programs studied. The Central and South Hastings Waste Management Board estimates diversion in their program at 13% of residential solid waste (RSW) (BioCycle, 1993). Diversion varied from 244 kg per household per year in Pickering, estimated to represent approximately 15% diversion, to 336 kg per household per year in Newcastle, representing an estimated 32% of RSW (this was reported for one of the heavier times of the year for yard waste generation and may account for the higher diversion rate) (Compost Management, 1992a, 1992).

In Metro Toronto food (vegetable) wastes were reported to have the highest compost rates, above 80% throughout the four seasons. Garden wastes were the next highest, followed by lawn clippings and leaves (Maclaren, 1990).

Costs

The Ontario Ministry of the Environment and Energy will cover two thirds of the cost of composters/digesters and in some cases, will support promotion and education.

The costs of diverting waste through backyard composters vary, but are significantly lower than other waste diversion costs, on a $/tonne or $/household basis.

The Newcastle results indicated a waste diversion cost of $18.75/tonne. This is based on a ten-year amortization period for each composter and does not include government subsidies. Costs typically range from $15 to $50/unit when bought in bulk (RIS, Sutcliffe, 1993). In Pickering (Compost Management, 1992a), the waste diversion cost was estimated at $24.32/tonne. The latter was based on an overall cost of $59.35 per composter, of which 65% covered the cost of the composter itself, 22% covered administration, promotion and education and, 13% covered project monitoring (such extensive monitoring of pilot projects would not normally be incurred.)

The Metro Toronto program in 1992 cost a total of $2.7 million. 67% was borne by the Province, primarily for the cost of the composters. The rest was paid by Metro Toronto, consisting of the remaining 20% for composters and 13% for administration, of which 4% went to public education (BioCycle, 1993).

Issues

Some problems were experienced with use of the composters. These problems varied depending on composter type and geographic location. Surveys of residents have identified the following concerns and problems with backyard composters (Compost Management, 1992, 1992a, Waterloo, 1992, Ferguson, 1993, Maclaren, 1990):

- insects, particularly flies, in and around the composters;
- freezing in winter;
- size limitations;
- poorly-fitting and insecure lids;
- odours;
- scavenging animals.

It is not clear from surveys whether long-term participation would be affected by these concerns. Only 3% of participants surveyed in Metro Toronto cited these as reasons to stop using the compost units. Freezing and size limitation were noted to temporarily stop use (Maclaren, 1990).

Social Acceptability

Despite such problems, the vast majority of participants in backyard composting programs have been strongly supportive of the concept. All respondents to the Newcastle survey reported that they would recommend backyard composting to their neighbours (Compost Management, 1990).

Composting does not seem to be viewed as a nuisance. While 40% of respondents to the Metro Toronto survey reported having difficulty with tending the composting pile, few had difficulty with other composting tasks (Maclaren,

1990). In Newcastle, only one participant described composting as time-consuming or troublesome (Compost Management, 1990).

Many people had been composting prior to the launch of major demonstration projects and composting programs. In Toronto, it was found that about one third of those surveyed had been composting some of their organic wastes prior to receiving a composter from the City (Maclaren, 1990). In Pickering, 14% reported composting prior to the demonstration project (Compost Management, 1992a).

Most respondents to the Metro Toronto survey said they would continue to compost using their backyard composter even if curbside collection of food wastes was provided (Ferguson, 1993).

Residents with backyard composters still participate in separate collection of yard waste at the curbside. In Metro Toronto, 70% of respondents still put some yard waste out for collection in separate collection while 21% still put yard waste out with regular waste. This is thought to be affected to some extent by the size of composters, which cannot handle the quantity of yard wastes generated and, by yard wastes which are not suitable for the composters, requiring processing such as chipping (Ferguson, 1993).

One third to one half of participants surveyed in Newcastle found that using the composter tended to influence their buying habits to reflect greater conservation values (Compost Management, 1990).

Other On-Site Composting

Several new techniques are being piloted and utilized for on-site composting in multi-family residential and commercial settings. These projects are innovative and in early stages of development. The projects completed to date focus on maximizing participation in composting and identifying community benefits. Systematic studies of diversion have not yet been completed and estimates of diversion potential are inconclusive. There is a sense that participation in these programs does contribute an effective means of diverting further segments of residential and IC&I waste. However, it is difficult to efficiently monitor participation and diversion, and it has not yet been done.

A Report by The Recycling Council of Ontario presents an inventory of the types of programs presently in existence for multi-family and on-site IC&I composting. A summary of information that has been obtained from various studies of multi-family composting are presented in Tables B.2. to B.7 at the end of this chapter. The following presents an overview of findings from observation of multi-family residential and IC&I composting programs.

Vermicomposting

Vermicomposting (or worm composting) is an option for residents who may have limited space, or no access to an outdoor area for composting (e.g. apartment dwellers). Several worm composting units are presently available, however, worm composting has yet to receive strong public acceptance. The worm composter is versatile, in that it can be located outdoors in the summer, and must be brought in during the winter. It requires harvesting every three months and produces a high quality end product.

The Region of Peel conducted a study of verimcomposting by providing 250 units to multi-family residents. From this study, problems technical problems (i.e. with fruit flies and overloaded units) and public acceptance were identified. Findings of this study showed that vermicomposting in multi-family units may have a relatively low waste diversion impact of only about 28.5 kg/hh/yr.

It is believed that technical problems with vermicomposting may be overcome through public education. However, public acceptance may remain an issue (Recycling Council of Ontario (RCO), 1993).

Multi-family/Community Composting

Several studies of multi-family composting have been carried out, particularly in Ontario. The largest co-ordinated study of multi-family units was a year-long project initiated in 1990. Findings of this study are presented in Table B.2. In addition to this large co-ordinated study, 4 independent projects were assessed. Findings of these projects are presented in Table B.3.

The Metro Toronto study involved providing twenty-five 3-bin units to multi-family residents in the Region. Bins were purchased at a cost of $150 per unit to the buildings. The objective of this study was to test the 3-bin system for use in multi-family dwellings.

The study sample included ten co-ops, one university building and one community agency, and two privately owned apartment buildings. The mix included high-rise, low-rise and town house buildings. The project was largely run by volunteers on the principle of community development. The projects were varied in terms of the level of encouragement and support provided to residents to encourage composting.

The Metro Toronto project was evaluated by organizers as a success in that residents did participate, achieving an unspecified level of waste diversion and increasing awareness. Some problems with composting odours, contamination and lack of participation were noted. Volunteers also noted concerns with labour involved in maintaining bins. Residents involved in the studies were asked to measure participation for six months, but few actually did so. Volunteers were

hesitant to jeopardize composting participation by promoting this as a requirement.

A participation rate of 30% to 50% was reported for most bins utilized in the Metro Study. However, this must be recognized as a broad estimate only. Diversion was not generally measured in the study (RCO, 1993). For those who did not compost, inconvenience and the extra effort required were recognized as important barriers.

Another one year, multi-family composting demonstration was carried out in Waterloo, Ontario, beginning in June, 1991. Findings of this study are presented in Table B.4. The purpose of this study was to identify successful composting systems for multi-unit purposes. Two townhouses, two apartments and a fifth, unspecified dwelling, were included in the study. As in the Metro Toronto project, volunteers were responsible for maintaining the program, and were advised by the City of Waterloo and a Citizens' Recycling Committee. Composting bins were provided to participants free of charge.

This study tested 2 and 3-bin composter designs, with one single unit bin provided for overflow. After one year, two sites reported dramatic waste reduction, and the overall project was rated as a success at three of the five sites. The other two rated the project as a moderate success. Again, convenience to residents appears to have been a critical factor in promoting waste diversion through composting.

Participation was surveyed, but not accurately measured. After one year, participation was estimated to range from 10% to 29%, although it is estimated that it could be increased to 50% with extensive promotion and education efforts. A waste diversion rate was not measured (Farkas, 1992; RCO, 1993).

Several other studies have been conducted to identify potential impacts of multi-family composting on waste diversion using a variety of different bins and techniques (including vermicomposting) in various types of buildings. These include studies in Mississauga, Barrie, Markham, Thornhill, Kingston, Vancouver, and Europe, some of which are currently in progress. Findings of the Ontario projects are presented in Table B.5, and findings of projects reported in Vancouver and Europe are shown in Table B.6.

These projects utilized varying types of bins, placed different emphasis on and dedicated various levels of resources to resident education. Combined with different levels of maintenance and types of source separation, these factors are likely to reflect in varied results of the projects. Several of the projects have reported technical problems with odours and flies. As in the Metro Toronto and Waterloo studies, participation is reported to be affected by convenience and residents' levels of interest in waste diversion. Results (and anticipated results of

the studies in progress) do not appear to contradict findings of studies conducted in Metro Toronto and Waterloo.

A project undertaken by multi-family residents in Zurich, Switzerland should be highlighted for its apparent successes. It involves 13,000 to 14,000 households (or 10% of the city total). The residents volunteer time to maintain several compost piles, with one resident assuming responsibility as lead caretaker. The city provides collection containers and land, leaving the bulk of the initiative to residents. The project is encouraged through local regulations that support composting with a new requirement that landlords provide a place for composting activities. This program which began in 1985 continues to operate successfully (RCO, 1993)

From the evidence presented to date, it believed that despite initial skepticism, multi-family composting can be an effective practice for increasing waste diversion if it is carefully monitored and units are maintained. Participation levels and success rates are closely linked with effective education programs. Participation rates tend to increase over time, while participation does decline if education is not effective and active. The RCO report, which documents findings of multi-family composting projects recommends more detailed study of diversion potential (RCO, 1993).

Summary of Multi-family Composting Data

Despite the studies conducted by multi-family composting projects, there are presently no reliable data regarding diversion rates. Participation in multi-family composting is estimated in the studies at a low figure, generally in the 10% to 40 or 50% range. Where participation rates are based on surveys, these figures are considered likely to be high (RCO, 1993).

Waste diversion for multi-family composting was not factored into waste diversion estimates for the GTA because reliable figures are not presently available. Until studies are conducted that systematically monitor participation and diversion from this method, the potential of multi-family composting in waste diversion will remain speculative.

Mid-Scale On-Site Composting

Like multi-family composting, Mid-Scale On-Site Composting is in an early stage of development. A summary of several projects is presented in Table B.7. At present, mid-scale facilities are reported to have high capital costs (in the range of \$5,000 to \$25,000). However, the facilities are easy to operate and one type presently on the market may be located indoors. Preliminary studies show that mid-scale, on-site composting projects may have the potential to process large amounts of waste, from about 45 to 90 kg/day (RCO, 1993). However, due to lack of systematic data collection, results are currently considered inconclusive.

For that reason, these figures are not factored in waste diversion estimates for the GTA.

Experience with Mid-Scale On-Site Composting
Composting units presently in use for Mid Scale On-Site Composting include the:

- Mid-Scale Rotating Barrel
  A "home-built" composting barrel has been operating at Ecology Park in Toronto since August, 1992. This unit receives food waste from two neighbouring natural food stores. The unit is a cylinder with doors on both ends, that rotates on casters and can be manually rotated. The unit can receive up to approximately 3 tonnes per year.

  Material is kept inside the chamber and composted with wood chips for up to four weeks, at which it is turned into a vermicompost barrel. From start to finish, the process requires approximately 6 weeks to produce a finished compost product (RCO, 1993).

- 3-Bin Units
  Bell Canada in Etobicoke is using a 3-bin wooden composter system to compost food waste form the cafeteria and all 12 floors of an office building. Together, the composters receive approximately 35 tonnes of source separated compostable material/yr and are composted with leaves, soil, and wood chips for bulking when necessary. Material is aerated by turning, and finished compost product is used on-site or by sold by a charitable organization for fundraising (RCO, 1993).

- Mid-Scale Vermicomposting
  Harbourfront, in Toronto, installed a vermicomposting system in August 1992, which is used to divert food waste from three quick service food outlets, from disposal. Food waste is source separated, and meat scraps are removed. Food waste is mechanically shredded before being fed to the worms.

  The system is made up of 16 worm bins that are enclosed in an insulated metal container with hinged locking covers. A heat/ventilation system ensures that air is allowed in but heat does not escape. The system is capable of receiving between 13 and 22 kg per day. Some problems (associated with system overload) have been experienced with odour and fruit flies. However, technical problems are easily mitigated by reducing loads.

  The production cycle takes approximately 2 to 3 months, and finished product has been used on-site at Harbourfront. The capital cost of the system was $10,000 (RCO, 1993).

- Envirocycle 5000

  The Bell Canada tower in Montreal is composting food preparation waste from food service outlets in this unit. Source separated organics (with grease discouraged) are placed into the rotating cylinders with peat moss added as a bulking agent. The unit is powered by a motor, and rotates 6,000 time per day, with constant aeration. Finished compost is produced within about two weeks. Approximately 240 tonnes/yr are diverted through ongoing use of the unit. Capital cost of the unit was $5,900, with an added annual cost of $360 for peat moss and $1/day electricity (RCO, 1993).

- Ecolyzer

  The Ecolyzer is an in-vessel mechanized composter that has been used since 1992 at the Mimico Correctional Centre. The unit composts approximately 50 kg/person/year from the 350 inmates.

  Plate scrapings and food preparation scraps are composted in the unit (with the preferred exception of grease and bones) Each cycle requires approximately 55kg to 75 kg of peat moss as a bulking agent. The unit operates on a 30 day cycle, where food is placed one of two units for the first 15 days, and then composted while the other chamber is filled. Computer controlled aeration and temperature controls are applied as the compost is electronically mixed. Each cycle produces approximately 225 kg of finished compost.

  The Ecolyzer unit is sold for approximately $20,000 (RCO, 1993).

At present, the bins require high capital costs (from $5,000 to $25,000), although it is likely that cost will decrease with increased sales. Energy costs associated with mechanized versions further increase operating costs.

Future Research in On-Site Composting

Until further research is completed, reliable waste diversion estimates focusing on actual waste diversion or potential for diversion through on-site composting are not available. Research into actual participation rates and diversion of each of the above "other" on-site composting mechanisms may provide the level of reliable data that could be used in preparation of accurate diversion estimates attributable to these mechanisms. Further research in this area is warranted.

Metro Toronto 3-Bin Pilot Project

Twenty-five 3-bin composters are located at housing co-operatives and apartment buildings in Metro Toronto. The bins at each site are maintained by resident volunteers or a Compost Committee.

Location	Dwelling Type	Composter Type	Program Start Date	Participation Level	Methods of Education	Comments
Bain Co-op	Townhouses, 254 units around 7 courtyards, much green space	Seven 3-bins	1991	50-60%	Workshop by Master Composter, signs on bins, tips in newsletter, phone tree for troubleshooting	Residents of each courtyard are responsible for maintaining their own bin. Samples of compost were displayed in Co-op office. Compost used on site for gardening.
Harbourside Co-op	Townhouses, 3-story, 55 units, much green space	3-bin	1991	75%	Meetings, flyers, signs on bins.	Volunteer-managed program. Compost used on site on gardens.
Shalom House	Hostel with community kitchen and bi-weekly market	3-bin	Summer 1990	n/a	Workshop led by Metro staff.	Bin is maintained by volunteer community gardening group. Compost used on the community garden.
Spruce Court Co-op	Townhouses, 78 units, much green space	3-bin	November 1990	25%	Workshop by Master Composter, literature to all residents, sign on bin, reminders in newsletter.	Odour complaints led to formation of Compost Committee which now looks after the bin. Compost is used on-site
Swansea Village Co-op	3 Low-rise buildings, 96 units, little green space	32-bin	1991	50%	Workshop by Metro staff, reminders in newsletter, q & a sessions at the bin.	Managed by volunteers. Rat problem was solved by lining the bin with wire mesh.
Oak St. Co-op	Townhouses & two high-rises, 149 units, little green space, co-op with paid caretaker	3-bin	Fall 1991	30%	Pamphlets to all members, presentations at meetings.	Managed by volunteers and caretaker. Bin was relocated due to odour problems. Compost was dug into plant beds.
Charles St. Co-op	Two high-rises, 713 units, no green space, student and social housing	Two 3-bins	1991	25-30 tenants	Brochures, article in newsletter, poster in lobby calling for volunteers.	Bins were not maintained after the key volunteer moved. Bins were removed due to rodent infestations.

Road	apartment building with 27 units, little green space					Compost used on-site in flower beds
Kalmar Co-op	Seven low-rise buildings, 113 units, much green space, private waste collection	Two 3-bins	1990	50%	Letters to residents, workshop by Metro staff, posters	Managed by volunteers. Compost used on-site on gardens and as top dressing on lawns.
Anne Marie Hill Co-op	High-rise and townhouses, 135 units, little green space	3-bin	1990	10%	Newsletter articles, flyers	Managed by one volunteer. Low level of resident involvement. Compost is used on flower beds
Norris Crescent Co-op	Street-long co-op of ten, 6-unit buildings, much green space	3-bin	1990	40%	Literature to all co-op members, word-of-mouth	Managed by volunteers. Compost used on-site
Heath St. Co-op	Low-rise, 49 units, little green space, private	3-bin	1990	30%	Literature to all co-op members	Some difficulty in getting volunteers to look after the bin. Compost is dug into herb and flower gardens
York University	High-rises, much green space, not served by municipal collection	Five 3-bins	Fall 1991	10%	Workshop, word-of-mouth, flyers	Managed by volunteers and university grounds staff. Difficulty in maintain volunteer involvement. Bins damaged by wind
Beverley Sullivan Co-op	Townhouses, 8 units, much green space	3-bin	1991	100%	Literature to all members, word-of-mouth.	Managed by leading volunteer who gradually involved all residents. Compost used on-site

Source: RCO, 1993

Table B.5

Other Projects in Metro Toronto

This table lists a sampling of sites where groups have set up their own composting projects outside of the municipally-sponsored program.

Location	Dwelling Type	Composter Type	Program Start Date	Participation Level	Methods of Education	Comments
Fieldstone Co-op	67-unit co-op	Two Eco-Balance bins	Fall 1991	30%	Co-op newsletter, flyers on bulletin board, word-of-mouth.	Managed by one volunteer who has found the material difficult to turn in these bins. Compost used on the lawn on sandy soil.
Cawthra Co-op	Low-rise, 84 units in three buildings, much green space	3-bin	July 1990	30%	Newsletter, posters in lobby, literature to all members.	Managed by one volunteer. Finished compost is "almost fought over".
Hugh Garner Co-op	Eight-story co-op with 181 units	3-bin	August 1989	not known	Flyers, meetings, word-of-mouth.	Managed by a Compost Committee. Compost is used on site.
Saulter Park	Bin is in a vacant-lot-turned-community-park	3-bin	June 1992	10-15 households	Door-to-door contact, brochures, signs posted around the neighbourhood.	Managed by the Compost Committee of the Saulter Street Residents Association.

Source: RCO, 1993

Waterloo Demonstration Project

The Waterloo multi-residential demonstration project was a joint effort of the City of Waterloo and the Waterloo Citizens' Recycling Committee. Five Dwellings of various types were provided with 3-bin and backyard composters.

Location	Dwelling Type	Composter Type	Program Start Date	Participation Level	Methods of Education	Comments
285 Sandowne Drive	Townhouse condominiums, 36 units, much green space, managed by a private company, private contractor collects garbage	Two 3-bins	Summer 1990	50%	Pamphlets, general meeting.	Managed by volunteers. Compost is used on gardens and re-used in the bin. Waste collection costs reduced by half.
Robinwood	Townhouse condominiums, 116 units, much green space, private garbage collection	Two 3-bins and seven backyard composters	1990	50-75%	Newsletter, brochures, flyers, meetings.	Managed by volunteer committee. Compost used on-site. Waste collection costs reduced by $200/month.
155 Lincoln Road	6-story rental building, 46 units, "Y" housing for women, some green space	3-bin	1991	30%	Instructions given at tenants' meetings.	Managed by one volunteer. Compost used on-site in gardens.
400 Parkside Drive	High-rise, 108 units, rental building	3-bin	1990	not known	Meeting, literature to tenants, notices, word-of-mouth	Managed by volunteers. Each household given a key to access the bin.
225 Benjamin Road	Townhouse condominiums, 84 units, some green space, private garbage collection	One 2-bin unit and four backyard composters	1990	50%	Newsletter, word-of-mouth	Managed by volunteers. Compost is spread on flowerbeds and lawns of common areas.

Source: RCO, 1993

Other Projects in Ontario

Location	Dwelling Type	Composter Type	Program Start Date	Participation Level	Methods of Education	Comments
Mississauga	High-rise, 20 stories	(material composed off-site)	1991	Very low	Meeting called for residents, information provided.	Experiment to test collection. Tenants carried food waste in plastic buckets to a cart outside of the building.
Barrie	Various multi-unit dwellings	Worm bins, balcony bins, backyard bins, 3-bins, trial operation of Envirocycle 5000	Launched in Fall 1992	Not yet known	City waste management newsletter, presentations to building owners and managers, information package to residents, display in common area of buildings.	Focus is on individual worm and balcony bins rather than shared composters.
Markham	High-rise, 52 units, privately-owned building with private waste collection	3-bin	1991	40%	Information meetings, reminder notices, word-of-mouth	Program initiated by the property management company, composter maintained by superintendent
Thornhill	High-rise, 140 units, privately-owned building with private waste collection	3-bin	Summer 1992	Not yet known	Information meeting	Composter is maintained by superintendent
Kingston	High-rise, 125 units, rental building on large lot	6 Eco-Guardian bins	August 1991	75%	Meeting, delivery of notices, word-of-mouth	Program initiated and managed by the superintendent. Tenants place food waste in a collection bin in the garbage room. After minor vandalism, bin doors were attached with chains. Compost is used for landscaping and given to tenants for their plants.

Source: RCO, 1993

Multi-Residential Projects in Vancouver, Helsinki and Zurich

Location	Dwelling Type	Composter Type	Program Start Date	Participation Level	Methods of Education	Comments
Community Alternatives Co-op, Vancouver	3-story co-op	Homemade rotating barrel in basement	1983	100%	Not known	Initial odour and fly problems. Modifications improved the system's performance. Compost is used on-site on fruit trees and gardens.
Helsinki, Finland	11 apartment blocks at Helsinki University	600-litre insulated steel bins	1987	40%	Guide called "How to Compost on Blocks of Flats"	Bins are maintained by volunteer compost caretakers at each site; duties are rotated among a few people.
Zurich, Switzerland	Various multi-residential buildings	Collection bin and 3 or 4 piles for composting	1985	10% of population	City staff provides information, advice and site visits	A volunteer resident leads each compost project. Maintenance of the pile is shared by participating households. Compost is used by residents on their balcony gardens and window boxes.

Source: RCO, 1993

Mid-Scale Commercial and Institutional Composting Sites

Site	Composting System	Feedstock	Costs	Comments
Bell Canada Office Tower, Montreal	Envirocycle 5000 by Vision Recycling: Three rotating cylinders encased in fibreglass box, powered by a motor	Non-fatty food preparation waste from 14 food service outlets	$5,900 and $30/month for peat moss (optional) Capacity is 100 pounds/day	Unit is located inside the building. Building maintenance staff collect the food waste and operate the composter. Compost is removed every 2 week.
Mimico Correctional Centre, Etobicoke	Ecolyzer by Eco Corporation: in-vessel mechanized system with two chambers	100 lbs./day of plate scrapings and food preparation waste	$20,000 or $575 to lease monthly	Unit is located outdoors by the food service area. Liquid is strained before food waste is added to the system. Compost is removed after 30 days.
Ecology Park, Toronto	Rotating barrel by Grow T.O.Gether Community Gardeners: 8' long cedar cylinder with two sections divided with hardware cloth, rotates with aid of a boat winch	100 lbs./day of food waste from local natural food stores	$4,000 for construction	Designed, built and operated by volunteer community gardeners and RCO Master Composters. Compost is removed after four weeks to an insulated holding unit for final decomposition.
Harbourfront, Toronto	Mid-scale vermicomposter by Vermitech Systems: 16 worm bins enclosed in an insulated metal container	50 lbs./day of food preparation waste from Harbour front restaurants	$10,000	Maintenance staff operate the system. Food waste is put through a shredder before being fed to the worms. Compost is harvested after a few months by Vermitech Systems.
Bell Canada building, Etobicoke	3-bin wooden composters by Butler & Baird	100 lbs./day of food waste from the cafeteria and from all floors of the building	$12,000	Employees deposit food waste into containers on each floor by the elevators. Maintenance staff carry out food waste and maintain the bins.

Source: RCO, 1993

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SCHEDULE C

RESIDENTIAL DIRECT COST

SCHEDULE C
Residential Direct Cost

Introduction

In a direct cost system, waste generators pay for waste collection on the basis of the amount of waste generated. Most commonly, the rate structure increases with greater quantities of garbage collected. Direct cost is current practice for most IC&I wastes, and can be applied to the residential sector through pay-by-the-bag, selected level of service, number of cans, etc.

The advantages of a direct cost system include:

1. It creates an economic incentive for waste reduction.

2. Municipal solid waste management costs decrease, because of the lower quantities of garbage sent for disposal.

3. Public understanding of solid waste management costs improves.

4. Residents realize direct monetary gain through waste reduction.

5. Residents pay in proportion to the wastes generated (this system is a step towards full cost accounting).

The disadvantages of a direct cost system are as follows:

1. It may be initially received negatively by the public.

2. It may discriminate against low income or high occupancy households.

3. It requires complex administration and can often be expensive to implement and operate.

4. It may lead to illegal dumping and burning.

5. It may be difficult to control some of the problem elements (such as over-stuffed and heavy bags/containers).

Types of Direct Cost System

There are a number of types of direct cost programs. These include:

Metered bag
In this system, standardized marked bags can be purchased at local retail outlets, or are given to the householder by the city.

Metered tag
In this system, marked tags (that stick to bags or are tied to cans) are sold to the householder. The distribution networks for these tags are the same as for metered bags. Some form of volume restriction is generally used with metered tags. This limits the size of container to which the tag can be attached (e.g. maximum 30 gallon volume).

Per container/bag rate
In this system, the generator pays for the number of containers or bags set out. Some communities restrict the number of garbage containers which can be used by one household. The hauler is responsible for monitoring the number of bins or bags set out by each household. Any kind of container is accepted in this system.

Graduated per container rate
In this system, generators pay an increasing amount for additional containers. The hauler monitors the number of bins set out by each householder. Any kind of container is accepted.

Weight-based charges
In this system, the amount of general waste sent for disposal by the generator is weighed as it is collected and the charge to the householder is based on this weight. Usually an electronic system to track weights from each household is required for the implementation of weight-based charges. Although this type of system might encourage higher diversion than volume-based systems, the level of complexity has prohibited its widespread use to date. However, some municipalities are conducting trials with weight-based systems and the required technology is expected to become more available in the future (Skumatz, 1990, 1991; Andresen, 1992).

Standardized container rental
In this system, a bin is rented from the hauler by the householder. The rental fee for the container and the waste collection service is charged monthly.

Container licenses
In this system, households purchase an annual license for each container placed at the curb. The fee varies with the size of the container.

SCHEDULE C
Residential Direct Cost

Introduction

In a direct cost system, waste generators pay for waste collection on the basis of the amount of waste generated. Most commonly, the rate structure increases with greater quantities of garbage collected. Direct cost is current practice for most IC&I wastes, and can be applied to the residential sector through pay-by-the-bag, selected level of service, number of cans, etc.

The advantages of a direct cost system include:

1. It creates an economic incentive for waste reduction.

2. Municipal solid waste management costs decrease, because of the lower quantities of garbage sent for disposal.

3. Public understanding of solid waste management costs improves.

4. Residents realize direct monetary gain through waste reduction.

5. Residents pay in proportion to the wastes generated (this system is a step towards full cost accounting).

The disadvantages of a direct cost system are as follows:

1. It may be initially received negatively by the public.

2. It may discriminate against low income or high occupancy households.

3. It requires complex administration and can often be expensive to implement and operate.

4. It may lead to illegal dumping and burning.

5. It may be difficult to control some of the problem elements (such as over-stuffed and heavy bags/containers).

Types of Direct Cost System

There are a number of types of direct cost programs. These include:

Metered bag
In this system, standardized marked bags can be purchased at local retail outlets, or are given to the householder by the city.

Metered tag
In this system, marked tags (that stick to bags or are tied to cans) are sold to the householder. The distribution networks for these tags are the same as for metered bags. Some form of volume restriction is generally used with metered tags. This limits the size of container to which the tag can be attached (e.g. maximum 30 gallon volume).

Per container/bag rate
In this system, the generator pays for the number of containers or bags set out. Some communities restrict the number of garbage containers which can be used by one household. The hauler is responsible for monitoring the number of bins or bags set out by each household. Any kind of container is accepted in this system.

Graduated per container rate
In this system, generators pay an increasing amount for additional containers. The hauler monitors the number of bins set out by each householder. Any kind of container is accepted.

Weight-based charges
In this system, the amount of general waste sent for disposal by the generator is weighed as it is collected and the charge to the householder is based on this weight. Usually an electronic system to track weights from each household is required for the implementation of weight-based charges. Although this type of system might encourage higher diversion than volume-based systems, the level of complexity has prohibited its widespread use to date. However, some municipalities are conducting trials with weight-based systems and the required technology is expected to become more available in the future (Skumatz, 1990, 1991; Andresen, 1992).

Standardized container rental
In this system, a bin is rented from the hauler by the householder. The rental fee for the container and the waste collection service is charged monthly.

Container licenses
In this system, households purchase an annual license for each container placed at the curb. The fee varies with the size of the container.

Volume restriction
In this system, residents can only place a maximum number of containers (of a limited size) at the curbside. This system is not very popular. It can be combined with a fee, as with other systems described above.

Reduced rate option
In this system, residents who consistently generate low quantities of waste pay a significantly lower flat rate than the regular collection fee.

Successful implementation of a direct cost system requires a number of elements. These include:

Education
It is important to prepare the community by stressing and explaining the fairness of the system. An on-going public education program, including the distribution of waste reduction information, and showing waste management's costs as a separate item on the homeowner's tax bill, will provide the community with the background knowledge they require to support the system.

3Rs Opportunities
It is necessary to ensure that the community has access to public systems that encourage them to reduce, reuse and recycle their waste. These include curbside collection of recyclables and yard waste, distribution of backyard composters, household hazardous waste depots or pickup, etc.

Convenience
The direct cost system must be convenient for the community to use. There must be a distribution network set up for bags/stickers/containers to ensure that they are readily accessible to the public. The distributor must be fairly reimbursed for their costs. This will encourage their on-going participation in the program.

Enforcement
Some form of enforcement is necessary to keep the system operating smoothly. Methods are needed for solving potential illegal dumping by the homeowner. Keeping enforceable weight limits (50-60 lbs./bag) on containers discourages over-compaction of the containers.

Level of Charge
If the charge to the homeowner is too low, the program may not be a very effective economic incentive for waste reduction. However, if the charge is too high, it may encourage illegal dumping or burning of waste, tag theft, etc. It may be convenient for the municipality to institute a minimum fee equal

to the cost of one bag/week, in order to overcome the problem of uneven cash flows.

Direct cost systems have been implemented in a number of rural communities in Ontario, and in a number of cities in the United States. Some of these systems are described below. Table C.1 summarizes information on a number of direct cost programs.

Town of Gananoque

The Town of Gananoque was the first municipality in Ontario to implement a full direct cost garbage disposal system. Both single and multi-family dwellings are included in the program. The system was introduced in 1991. The waste disposal fee was removed from the 1991 tax bills, but the fee for waste collection remained on the taxes. A charge of $1.00/bag was charged to break even on the cost of waste disposal. Tags were made available to residents in sheets of 12 from grocery stores or the townhall. No commission was paid to the distributors. In response to some initial complaints about the program, the town implemented a "2 for 1" program, in which residents received one free garbage tag in return for every 2 bushels of recyclables delivered to the depot.

The results of the program were a 45% reduction in waste collected (from 32 to 16 tonnes per week) after program startup. The quantity of recyclables arriving at the depot increased from 8 tonnes to approximately 22 tonnes per month, which amounted to 275 tonnes in 1992, or 23.5% of the waste stream (Cummings, 1993). Composter distribution doubled to cover 50% penetration of the residential households. There was also a noticeable change in consumer habits, as residents began to switch away from over packaging and non-recyclable packaging.

Some of the problems encountered with the program included illegal dumping, use of commercial bins for (illegal) disposal of residential waste, use of half-tags or counterfeit tags, public misconception that the town was charging twice for garbage disposal (i.e. on taxes and with tags), and some multi-residential tenants were storing garbage. The town has amended a bylaw so that it can now clean up waste and charge for their services.

Seattle, Washington

Seattle instituted a variable can rate structure in 1981, whereby residents paid more for additional cans of waste to be picked up. In 1989, the City adopted an Integrated Solid Waste Management Plan, with the goal of achieving a 60% reduction/recycling level by 1998 (Pealy and Ostrom, 1992). They determined that restructuring rates to encourage recycling would not, by itself, increase recycling. The City evaluated a number of different rate options, and recommended a substantial increase to the additional can rate (the charge for

Table C.1
Summary of Direct Cost Programs

Location and Reference	Population	Date of Implementation	Waste Reduction Initiatives	Before Direct Cost (y/n/same)	Description of Program	Overall Diversion Rate in Jurisdiction	Information on Diversion Impacts (if available)	Comments on Program
Marion County, Oregon (2,13)	228,000	decades previous	Curbside blue-box,Recycling depots, Yard Waste drop-off		Variable rate set by cities or county ($9.20-$15.20), Multi-family charges higher	27-34%		
Seattle, Washington (1,2,7,9,10,14,15)	495,000	1981	Curbside and drop-off recycling, fee-based yard waste collection	No	Rate set by city/hauler ($10.80/1 can, $12.85/2 cans etc.) Seattle ($5.95/can, $9 per extra)	40% (1991)	24% diverted before municipal recycling programs implemented	Experiment with weight-based charge seems promising
Tomkins County, NY (2,16)	96,000	March 1990	Curbside recycling, Yard waste curbside collection and drop-off		Service fee (system charges) tag fee (covers tipping)	30% (7.2% is sewage sludge)	Can weight down 10 lbs (to 20 lbs) with tag and recycling programs	Questionnaire indicates higher recycling participation
Hennepin County, Minn. (2)	1,000,000		Curbside and drop-off recycling programs, Curbside yard waste		Cities, flat fee with R3 credit, haulers variable can rates ($15/mon. 1 can, $18/mon. two cans, etc.)	50%	38% drop in waste generation	Recycling Credits (14-42% of collection charges in some areas)
Town of Gananoque, Ontario (3,4,5,8,10,17)	5,000	July, 1991	Depot recycling, Home composter program	S,Y	Mandatory tag system, $1.00/tag.		Substantial decrease in waste at transfer station since direct cost	Free tag for two bushels at recycling station. Home composter demand up
Township of Westmeath, Ontario (10)	2,300	September, 1991	Recycling depot, Curbside recycling, Backyard Composting	N (curbside), Y (others)	Special bags, $3.00 each.		Unquantified waste decrease reported since direct cost implemented	Increase in composting and recycling programs since direct cost implemented
Township of McNab, Ontario (10)	5,200	October, 1991	Curbside Recycling	Yes (1989)	Special tag for more than four bags ($1.00 per tag)			
Village of Woodville, Ontario (10)	675	September, 1991			Colored bags ($1.25/bag)		Direct cost system discontinued in 1992	County control of waste disposal made user-fee unnecessary
Borough of Perkasie, Penn. (1,6,7,10,13,15)	7,900	January, 1988	Curbside and depot recycling.	Yes	Mandatory bag system ($2.00 - 40 lb bags, $1.25 - 20 lb bags)	32%	18% drop in waste generation	Increased recycling
Carlisle, Penn. (6,7,10)	19,000	June, 1990	Curbside recycling		Mandatory bag system ($2.10/bag)	30%	Garbage has decreased	Recycling increase
Duluth, Geo. (7,10)	10,000	1970	Curbside recycling	N (1989)	Mandatory bag system ($15.50 for 20 bags)			Recycling has increased 48% weekly participation rate
Grand Rapids, Mich. (7,10,13)	170,000	1971	None		Mandatory bag and tag system ($.65/tag, $.75/bag)		Increased illegal dumping as disposal costs rise	
High Bridge, NJ (7,10,13)	3,800	1988	Curbside recyclables collection (no blue-box supplied)		Mandatory tag system ($1.60 per sticker)		Garbage decreased 21%.	
Holland, Mich. (7,10,13)	30,000	1988	Recycling extra charge		Coloured bag program, customer owned containers or supplied containers			Illegal dumping minor problem
Lansing, Mich. (7,10)	120,000	1974	Curbside recycling	N (1991)	Optional bag program ($1.50/bag). Can use private hauler is desired.			

Table C.1 Cont'd
Summary of Direct Cost Programs

LaTrobe, Penn (7,10,13)	10,000	1962	Curbside recycling		Mandatory bag program ($6.50/25 bags)		No increase in garbage, stable levels	Recycling levels stable. Problems with garbage imported from out of town
Olympia, Washington (7,10,13)	30,000	10-15 years previous	Curbside recycling	N (1989)	Mandatory container system (variable (charge with recycling credit)	28%	No increase in garbage	
Plantation, Fl (7,10,13)	69,000	1975-1976	Curbside recycling	N (1990)	Mandatory bag system ($1.20/bag)			Recyclables declined slightly in 1992
Wilkes-Barre, Penn (6,7,10,13)	47,500	1988	Apartment blue bag program	1988	Optional Blue-bag system for apartments ($1.00/bag). Households pay flat fee for garbage collection		15% reduction in garbage produced	Recyclables weight steady
Woodstock, Il (7,10,13)	16,000	1987	Curbside recycling	1987	Mandatory bag system ($1.98/bag)		Decrease in garbage	Steady increase in recycling since program introduced
St. Cloud, Minn (12)	48,812	July, 1991	Curbside collection	S (1991)	Mandatory bag system ($2.00/bag, max 25 lbs) $1.00/clear yard waste bags		Recycling doubled, 50% reduction in waste requiring disposal	Some illegal dumping
Village of Ilion, NY (7,10,13,15)	8,888	June, 1988	Curbside collection		Mandatory bag system ($2.00 and $1.75 bags)	52%	44% decrease in waste generation	Recyclable weights increased. Illegal dumping up 2%

(1) Andrews, Katya, "Communities Weigh Merits of Variable Rates", World Wastes, November 1992
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(3) Cummings, Christopher, "Town reduces waste 50% with bag-tag system", Civic Public Works, March/April 1993
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(5) For R Information (staff), "User Pay System Cuts Waste, Boosts Recycling", For R Information, Winter 91-92, p.2
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(8) Ontario Recycling Update (staff), "Gananoque 'bag tag' program reduces garbage, increases recycling", Ontario Recycling Update, Jan-Feb 1992, p. 5
(9) Healy, [illegible] and [illegible], Aaron, "Seattle's Road to Recovery", Seattle Solid Waste Utility, 1992
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each additional can after one can of service), as well as offering a "mini-can" service (a 19 gallon can instead of the regular 32 gallon can), and introducing a curbside collection program for yard waste. The cost for the one-can rate stayed essentially the same (from $13.55/month to $13.75/month), but the "additional can rate" went from $5.00/month to $9.00/month. The mini-can service was priced at $10.70/month. Note that the cost of curbside recycling is covered by the basic one-can rate, whether mini or regular can. This provides a stable source of revenue for the curbside recycling program, and encourages recycling by making garbage disposal look more expensive relative to recycling, which appears to be "free". The curbside collection of yard waste, which began in 1989, is available for an additional charge of $2.00/month.

To address the problem of occasional extra waste, customers can purchase stickers to attach to each bundle of waste. The stickers are sold for $5.00 each at various locations throughout the city. Residents can place extra waste at the curb in a bag, box or bundle on their regular garbage collection day. Extra waste is not collected without a sticker.

Eighty-nine percent of the City's single family garbage customers subscribe to one-can or mini-can service (64% are one-can customers, and 25% are mini-can customers). Only 1% subscribe to two or more cans of service. This contrasts sharply to 1988 percentages, when 60% of single family customers subscribed to one can, and 39% subscribed to two or more cans. Seattle's residents have reduced the average number of cans put out for pick-up from 3.5 to just over 1 can. Between 1986 and 1989, residential waste tonnage fell by 25%. Prior to the introduction of the city-sponsored recycling program, the recycling percentage in terms of actual tons of waste diverted was over 24% There is a 75% sign up rate for the curbside recycling program. The program collects about 3,500 tons per month, or an average of 63 lbs./hhld. Over 60% of Seattle's customers subscribe to the City's yard waste collection and composting program. In 1989, the curbside yard waste program diverted over 27,000 tons of residential waste to a composting facility.

There was some concern about the effect of the rate changes to low income customers and charitable organizations. These low income customers receive 77% off the basic one-can service. The cost of additional cans is reduced by 22%. The City offers subsidized dumping rates at the transfer stations for certain charitable organizations (about a 35% discount).

Perkasie, Penn.

Perkasie is a small town in suburban Pennsylvania with a population of 7,900. A direct cost program was started in 1988 at the same time as a curbside recycling program. This is a mandatory bag program with prices ranging from $1.25 for a 20lb bag to $2.00 for a 40lb. In 1988, the Borough diverted 900 tons

from the 2800 ton total requiring disposal in 1987, a net 32% diversion (Stone, 1990). An estimated 410 tons of this diversion came from increase recycling activity. The remaining 490 tons is assumed to have resulted from a decrease in the amount of waste generated.

Ilion, NY

Ilion is a small town in rural New York State roughly half way between New York City and Buffalo. The population of the town is 9,190. A direct cost program was initiated in the town in 1988. After the implementation of the program, significant changes to waste generation and disposal patterns were noticed.

The overall amount of waste collected and sent to landfill went from 4,380 tons in 1987/1988 to 2,120 tons in 1988/1989. This represents a reduction of 52% in the quantity of waste disposed. The amount of material collected in the recycling program went from 170 tons to 410 tons in the same time period. However, the increased recycling activity in no way accounts for the reduction in disposed tonnages. The total waste collected (recycling + disposal) fell 44% (4,550 tons to 2,530 tons).

Diversion Potential

All direct cost systems appear to achieve reductions in the quantities of waste sent to disposal. Table C.2 illustrates the diversion achieved by the four programs considered in detail.

Table C.2
Reported Residential Waste Flows (tonnes/year)

Location	Waste Generated (tonnes or tons)	Recycled (tonnes or tons)	Landfilled (tonnes or tons)
Gananoque, Ont.			
Before Direct Cost	1760	96	1664
After Direct Cost	1096	264	832
% change	-38%	+175%	-50%
Seattle Wash.			
Before Increase	225,600	40,600	185,000
After Increase	232,400	44,400	188,000
% change	+3%	+9%	+2%
Perkasie, Penn.			
Before Direct Cost	2,800	0	2,800
After Direct Cost	2,310	410	1,900
% change	-18%	NA	32%
Ilion, NY			
Before Direct Cost	4,550	170	4,380
After Direct Cost	2,530	410	2,120
% change	-44%	+141%	-52%

(Data from Morris and Glenn, 1990; Cummings, 1993)

It should be noted that although Seattle's waste disposal did not fall with the increase in price for disposal, this program had been established for a long time and most residents have probably altered waste generation habits. Also, more recent reports (Pealy and Ostrom, 1992) indicate that waste requiring disposal has fallen an additional 24% since the program change (however, no specific numbers were reported). Although the amount of waste diversion achieved through source reduction after implementation of direct cost systems seems to be quite dramatic, it is difficult to determine exactly what the effects of implementing this type of program might be. In the case of recycling participation, residential participation rates can be expected to increase in a fashion similar to the case studies. However, the level of diversion through source reduction is more difficult to quantify. The programs studied did not identify the manner in which the waste was diverted, for instance, through increased backyard composting, burning or illegal dumping. With the present literature, it is impossible to accurately quantify the source reduction expected implementation of a direct cost system. As a result, it was assumed that the level of source reduction in a direct cost system would be the same as in the Existing/Committed system, with increases in the level of participation in the recycling program, including Blue Box, leaf and yard waste separation and backyard composting.

Costs

A cost-related problem identified in Northfield, Minnesota is that residents are compacting their waste in order to put out as few bags as possible at the curb. This compaction does not change the weight of the waste, hence the payment collected for the volume of waste is insufficient to pay for tipping fee charged for the weight of the waste.

A number of additional administrative costs and problems associated with implementing a direct cost program were identified in Seattle. These include:

- Additional staff required for administering a variable-can rate structure
- Additional public information staff required to handle increased customer inquiries.
- A trained rates staff is required to design and implement the program. Seattle added two full-time staff, with strong economics backgrounds, to manage its rate development process (Pealy and Ostrom , 1992).
- Additional staff may be required to handle the promotions and education necessary to make a variable-can structure work.
- Revenues and costs can become less predictable. For example, Seattle did not anticipate the dramatic switch from two cans to one can of service when the Utility's additional can rate increased from $5.00/month to $9.00/month. This switch played a major role in the Utility's 1990 revenue shortfall (Pealy and Ostrom, 1992).

Morris and Byrd (1990) identified a number of additional costs:

- additional labour, materials, and equipment required to collect additional recyclable materials;
- additional labour, materials, and equipment required to collect litter or other diverted waste;
- additional costs associated with monitoring quantities of waste collected from each customer;
- additional costs of enforcing the unit pricing program and related restrictions;
- additional program administration costs.

In a study by Proctor and Redfern (1993), most of the communities surveyed reported that the direct cost system for waste collection and disposal had not contributed to any significant increases in administrative or equipment costs. The coded bag and coded tag systems, in particular, appeared to be the lowest cost programs to implement because in most cases, the distribution of tags or bags was decentralized (e.g. sold through local stores). The volume-based

systems did not create any substantial increases in costs for waste management equipment, and most communities charged residents for the full cost of the waste management service. Several programs reported that any increase in administrative costs was primarily based on the need for extensive education and promotion programs at the start of the direct cost program. Even communities with central billing systems indicated that their costs did not increase significantly once the billing system was set up on the computer. One community reported that their variable container system is expensive because of the rigid containers used in this program compared to bags or tags. The increased expense of this program has been passed on to the householder through higher direct cost payments compared to other programs.

A study carried out of direct cost programs in Perkasie, Pennsylvania and Ilion, New York found that the programs apparently achieved savings that more than offset the additional monetary costs associated with changes in waste collection and recycling programs (Morris and Byrd, 1990). Perkasie's annual costs were approximately 10 percent lower after introducing unit pricing and curbside recycling than they were under the previous fixed fee system. Ilion's costs were approximately 15 percent lower. Programs in both communities consisted of unit pricing and increased recycling. In addition, Perkasie reduced waste collection frequency to once per week from twice per week.

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SCHEDULE D

EXPANDED BLUE BOX

SCHEDULE D
Expanded Blue Box

Introduction

An Expanded Blue Box system is essentially Blue Box recycling with an expanded variety of dry recyclable materials. It attempts to achieve maximum diversion of recyclable materials using existing or modified facilities, and systems currently available to the municipality. This approach is combined with extensive promotion of backyard composting to allow residents the opportunity to divert organics from disposal.

Types of Expanded Blue Box Systems

The materials that may be collected in an Expanded Blue Box system include any or all of the following:

Plastics
- PET
- rigid plastic bottles & tubes (HDPE, PVC, PP, LDPE)
- film plastic (LDPE)
- foam plastic and rigid trays (PS)

Paper Fibre
- newspaper (ONP)
- corrugated cardboard (OCC)
- boxboard
- polycoat (e.g. milk cartons)
- phone books
- magazines and catalogues (OMG)
- mixed household paper

Metal
- steel cans
- aluminum cans
- aluminum trays and foil

Glass
- clear and coloured glass

Textiles

Standard curbside programs include newspaper, glass, cans and PET beverage containers. Some programs also include rigid plastic containers, boxboard and OCC.

Elements of Successful Expanded Blue Box System

There are three aspects of a conventional Blue Box program that can be enhanced by creating an Expanded Blue Box system:

- expand the range of materials that can be accepted in the Blue Box.
- improve the capture rate of currently collected materials
- increase the participation rate

A key component of an Expanded Blue Box program is the emphasis on preparation of recyclables (including rinsing and sorting) by the public, and an increase in sorting by the collection crew.

An aggressive Expanded Blue Box program can lower the average cost of collection and processing, since costs tend to go down as more boxes are distributed, more materials are added, and capture rates increase.

Case Studies of Expanded Blue Box Systems

Centre and South Hastings - Quinte Regional Recycling
(Quinte Regional Recycling, 1993)

Blue Box 2000 was launched in November 1991. The target of the program is to exceed a 50% diversion in the residential waste stream. The components of the program include an Expanded Blue Box recycling program (residential and IC&I), backyard composting, household hazardous waste program, and waste reduction initiatives. Although the Region had previously been involved in a Blue Box Plus! program (which started in fall 1990), they treated Blue Box 2000 as an entirely new program, with extensive promotional and educational activities. The focus of the launch was on what types of materials were to be collected, and how the householder was to set out these material at the curb.

Materials are pre-sorted into 6 groupings by the householder. Residents use a regular Blue Box, and a number of bags for materials at the curb. The driver then sorts these materials into 7 different compartments on the truck. The allowable materials are all of those listed above.

Participation studies of 1,200 households were conducted in Belleville and Trenton in the spring and fall of 1992, and spring 1993. The results include:

- average weekly set-out was in the 58% to 62% range;
- Blue Boxes that did not contain the full range of allowable materials were reduced from 4% in 1991 to 1% in 1993;

- Blue Boxes that contained unacceptable materials (e.g. window glass, aerosol cans) were between 4% and 9% of the total (as compared to 22% to 28% in 1991);
- the average capture rate for conventional materials was 79%. The overall capture rate of Blue Box 2000 materials, including non-participants, was 62% in 1992. The lowest capture rates were for mixed paper, film plastic, boxboard and textiles.

The study results showed that participation improved over time, and shows no sign of leveling off to date.

The average recovery rate for the Blue Box 2000 program for all the participating municipalities in Centre and South Hastings was 175 kg/hhld/year. It was 210 kg/hhld/year for urban residents based on the 1992 spring waste composition study. The average value for all participating villages, towns, cities, and rural households with curbside pickup (i.e. no depots) was 204 kg/hhld/year. This compares to an average value of 138 kg/hhld/year for all Blue Box programs in Ontario, and 130 kg/hhld/year for a small central Ontario city with a mature Blue Box program.

Burnaby, British Columbia
(Bischoff, 1992 and 1993)

An Expanded Blue Box program was implemented in Burnaby, B.C. January 1991. A multi-family recycling pilot program ran from April 1991 to May 1992, which included 368 units. This program was increased to approximately 10,000 units in 160 multi-family buildings in September, 1992. The curbside program currently serves 36,000 single-family households, and the 10,000 multi-family units.

The materials collected include ONP, boxboard, OMG, flyers, glossy paper, packaging material, glass, metal containers, PET and HDPE. Residents in single family dwelling sort their waste into three groupings: Blue Box for mixed containers, reusable vinyl yellow bag for boxboard, OMG, mixed paper, etc., and reusable vinyl blue bag for newspaper.

Residents in multi-family units receive reusable blue bags to store their recyclables. Participants carry the recyclables to a central area, where they are sorted into 3 colour-coded roll-out containers (same groupings as for single-family). The same three-way sort is used on the truck. The collection efficiency is high because the curb and truck sorts are the same.

The results of a 4-week survey showed a monthly participation rate of approximately 90%, and a weekly set out rate of 50-55% in 1991. Approximately 144 kg/hhld/year were recovered by the curbside (single-

family) program. The pilot multi-family program recovered an average of 2 kg/unit/week (104 kg/unit/year). In 1992 reported recovery was 161 kg/hhld/yr for curbside (single-family) collection. Multi-family service was operating only for part of the year. This compares to the provincial average of 138 kg/hhld/year for all Blue Box programs in Ontario, and an average of 130 kg/hhld/year for a small central Ontario city with a mature Blue Box program.

Edmonton, Alberta
(Egan, 1992 and 1993)

An Expanded Blue Box program was implemented in Edmonton in 1989. The curbside program currently serves 140,000 single family dwellings, while 11 depots serve 133,000 multi-family units. There are six more depots scheduled to open in 1993.

The materials collected in the curbside program include glass, metals (cans, certain types of scrap metal such as broken tools, small car parts, short lengths of pipe and tubing, eaves trough, etc.), all rigid household plastic (including PET, HDPE, etc.), plastic bags, mixed plastic excluding foam plastic (PS), ONP and inserts, magazines and catalogues, OCC, boxboard, polycoat, brown paper bags. ONP is bagged and OMG are bundled, and both are placed on top of the blue box. Plastics are bagged and clipped to the corner of the box with special clips. OCC and paper bags are bundled and placed beside the Blue Box. All other materials are placed in the Blue Box. Multi-family residents are supplied with mini-blue boxes. They transport the materials to nearby depots, where they are separated into containers. Currently, glass is not accepted at depots since there is no local market. Scrap metals are not accepted, while high grades of paper are.

The results of a 4 week survey indicated a 92% participation rate. In 1992, 29,115 tonnes of recyclables were collected in the curbside program. 1526 tonnes of material were collected through the depots. In 1991, a total of 28,812 tonnes of recyclables were collected. The total amount disposed at landfill in 1991 was 130,330 tonnes, representing a residential diversion rate of 18%.

Bluewater, Ontario
(Veilleux, 1993, RCO, 1993)

Bluewater Recycling Association is Ontario's oldest and largest Recycling co-operative, having opened in 1989. It currently serves approximately 42,000 in 45 municipalities. 38 of the municipalities, 38,000 households, are served by curbside collection of Expanded Blue Box materials, and 7 municipalities, 5,000 households, are served by depot programs. Direct cost programs have been instituted in four of the municipalities, two curbside and two depot programs.

Materials collected include ONP, OCC, boxboard (excluding depots), fine paper, steel and aluminum containers, aluminum foil, clear and coloured glass, rigid plastics (HDPE, LDPE) and some other plastics. Materials are sorted into four streams at the curb. Recovery rates from the curbside programs in 1992 averaged 209 kg/hh/yr. In the depot program the average recovery rate was 206 kg/hh/yr (RIS, 1993).

The communities operating direct cost programs have seen a significant increase in recyclables collected, from 50% in one community (begun in 1992) to 98% in another community (started in July, 1993).

Diversion Potential

The Blue Box Plus! program in Centre and South Hastings, which included conventional Blue Box materials plus boxboard, rigid plastic and corrugated cardboard, achieved approximately 18% diversion of the residential waste stream in 1991. The Blue Box 2000 program diverted 21% of residential waste in 1992. This figure includes recyclables only (Quinte Regional Recycling, 1993).

In Burnaby, approximately 5,200 tonnes of recyclables were recovered in 1991, which is equivalent to a diversion rate of 15% of the residential waste stream (Bischoff, City of Burnaby, 1993).

Approximately 28,812 tonnes of recyclables were collected in Edmonton in 1991. The total amount disposed at landfill in 1991 was 130,330 tonnes, therefore, the residential diversion rate was 18% (Egan, City of Edmonton, 1992, 1993).

In Bluewater the Expanded Blue Box programs have resulted in an average reduction of 30% in waste going to landfill as compared to 1987.

A summary of selected programs collecting an expanded range of materials is presented in Table D.1

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Table D.1

Summary of Selected Residential Recycling Programmes With Expanded Range of Materials

Community Jurisdiction	Collection Method: Set-out Method	Collection Method: # strm	Collection Method: Freq	# Hhlds Served	Participtn Rate (%)	Meas	Materials Collected: ONP	OCC	OMG	Box-board	Other Paper	Glass	Fe Cont.	Other Fe	Al Cont.	Other Al	PET	HDPE Rigid	LDPE Rigid	Other Plast	Poly-coat	Text	Rec. Rate kg/hh/yr	Diversion (%)	Comments	Ref. No.
Bluewater, Ont.	Curbside & depot	4	wkly	37,845-sf 5087-depot	not avail		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓			209-curb 206-depot		Estimate average 30% reduction in materials sent to landfill compared to 1987. 4 municipalities have direct cost system (50% - 98% increased recovery). Estimated 10% of depot materials are IC&I.	1 & 2
Brampton, Ont.																									Programme started Ocober, 1993	
Brossard, PQ	Bin	2	wkly	18,000	not avail		✓	✓	✓		✓	✓	✓		✓		✓	✓	✓				106		Switched from bag to bin programme	3
Burnaby, BC	Bin & 2 col. bags	3	wkly	36,000-sf 9,073-mf 45,073	85-90%	✓	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓					161	15% - 1991	Recovery rate does not include mf - limited 8-wk involvement - 1775 te. (9,073 mf units). Participation measured 1991	4
Centre & South Hastings	Bin + various Bags/bundles	7	wkly	33,600-sf 4,200-depot 1,000-IC&I	85-91%	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	191	21%	Recovery rate is for average curbside Blue Box 2000 collection for all C&SH municipalities; it does not incl C&D and bulky items.	5
Edmonton, Alta	Bin & bags/bundles	5 & 6	wkly	140,015	92%	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		210	18% - 1991	Two collection contracts - north & south Diversion includes all programmes.	6
Edmonton, Alta	depot	n/a		133,000	not avail		✓	✓	✓	✓	✓		✓		✓		✓	✓	✓	✓	✓		12		Expanded number of depots from 6 to 11 in Oct , 1992. Considering adding glass to depot prgrm.	6
Halifax, NS	Bag	1	wkly	105,900	75%		✓	✓			✓		✓		✓		✓		✓		✓		69		Recovery rate does not include Halifax County which is served only once per month.	7&8
Halton, Ont.																									Data not available	7&8
Hoffmann Estates, IL	Bin, kraft bags & bundles	4	wkly	12,000	97	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	376		Separate collection of reusable goods by Salv. Army.	9
Londonderry, NH	Bag & Bin		wkly	7,000	80-85%		✓		✓		✓	✓	✓		✓		✓	✓					175		Switching from bags to bins - preferred	10
Mississauga, Ont	Bin	6	wkly	137,000	not avail		✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓		✓	184			11
North Seattle	3 Bins	3	wkly	70,000	66%	✓	✓	✓	✓	✓	✓	✓	✓		✓		✓						331		Twice as much MWP generated as ONP - need for flex compartments Associated with direct cost system. Participation estimated from set-out rates averaged over year	12
Port Moody, BC	Co-coll, Clr Bag	1	wkly	4,000	90-95%	✓	✓	✓	✓		✓	✓	✓		✓		✓	✓	✓	✓	✓		154			13
South Seattle, WA	90-gal cart & bin for glass	2	mthly	78,500	71%	✓	✓	✓	✓		✓	✓	✓		✓		✓	✓					264		Associated with direct cost system. Added separate bin for glass in 1993. Participation estimated from set-out rates averaged over year	12
Vancouver, BC	Bin & 2 bags	3	wkly	90,500	90%		✓	✓	✓		✓	✓	✓		✓		✓	✓	✓				139		Bag for other paper added in 1993. Recovery rate does not include telephone directories, X-mas trees. Also does not include depots. Set-out rate measured at 52%.	14

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SCHEDULE E

RESIDENTIAL WET/DRY

SCHEDULE E
Residential Wet/Dry

Introduction

The term "wet/dry" is commonly used to refer to a type of solid waste collection program where the householder is required to separate their waste into 2 distinct streams - wet or the organic fraction, and dry, which consists of fibres, plastic, metals, etc. Each stream is stored separately in a container (typically a plastic bag or bin) which, in the case of single family residents, are then taken out to the curb for collection.

There are two main variations of a "wet/dry" system: two stream (wet and dry) and three stream (clean wet, clean dry and residue waste). A four stream system is in-use in Europe, but has not been used in North America to date (RIS, 1992, Bennet, R Cave & Assoc., 1988).

In a two stream system no separate residue or "garbage" option is provided to the householder, as residue is pulled from the recyclable or compostable material at a materials recovery facility (MRF) or compost facility.

To date, most trials have required separate collections with two trucks.

Four demonstration scale programs have been completed in Ontario to research the practicality of these collection systems. The host communities for these demonstration programs were:

- the City of Guelph;
- the City of Mississauga;
- the Region of Halton; and
- Metro Toronto.

Each of these projects is described briefly in the following text.

Region of Halton

Program Description (Proctor & Redfern, 1992, Nash, CMA, 1993)

For an 18 month period, the Ministry of Environment, Region of Halton and the Town of Oakville sponsored a pilot wet/dry demonstration consisting of approximately 600 homes located in one neighbourhood in Oakville. The demonstration relied on a three-stream collection system, and was designed to gather information on the following:

- operational details of the three stream collection system;
- processing requirements for the materials collected in the dry stream;
- marketability of the processed dry materials; and
- the quality of the finished compost produced using residential feedstock.

Collection of the dry stream of the demonstration ran from June 1991, to June 1992. Collection of the wet stream continued until the end of October 1992.

Handling of Wet Wastes

Households were asked to store and set out organic waste in plastic bags. Small green tinted plastic bags were provided for fruit and vegetable scraps, while larger clear plastic bags were used for yard waste. Meat scraps, bones, food contaminated paper and diapers were not part of the organic stream, but were to be placed in the third "garbage" stream. Households in the study area were initially requested to only put out leaf and yard waste for compost collection. Non-meat kitchen wastes were added in October 1991.

Organics were collected with a side loading packer truck and were delivered to a temporary composting site located at the Region of Halton Sewage Sludge facility. Collected food and yard waste was composted using turned, outdoor windrow technology. Compost Management, contractors for the facility, used the Region's SCAT windrow turner to help remove the plastic bags. Plastic that was left after the SCAT machine had passed through the material was removed by hand.

Handling of Dry Recyclables

Residents were provided with a large roll-out cart to store and set out the following recyclables, in addition to the traditional recyclable materials:

- rigid plastic containers
- film plastics
- polystyrene
- aluminum foil
- scrap metal
- boxboard
- fine paper
- tetra paks
- textiles

Dry recyclables were collected using regular hydraulic side loading collection vehicles and were delivered to the Region of Halton facility for processing. Results of the dry recycling processing trials available at the time of preparing

this report are summarized in Table E.1 (Mercer, Halton Public Works, 1993, P&R, 1992).

Preliminary Findings

Based on a year of data, a diversion rate of 58% was achieved through the Expanded Blue Box and composting collection streams and estimates for backyard composting. Of this total, 26% diversion was achieved through collection of dry recyclables, 17% diversion was achieved through curbside collection of compostables, and an estimated 15% diversion was achieved through backyard composting. This percentage is lower than the 71% that had been anticipated (P&R, 1992).

Data provided to RIS indicate that of all the waste collected at curbside, approximately 22% was diverted through the wet stream and 32% was diverted through the dry stream (Mercer, Halton Public Works, 1993)

The three stream collection system was able to divert 84% of the available recyclable material and 53% of the acceptable compostables (P&R, 1992).

Metro Toronto

Description of System (Sims, Metro Works, 1993)

Approximately 15,000 single family households, located in Etobicoke (2,600 in each of two areas), North York (8,000) and the City of Toronto (1,500) were involved in Metro Toronto's "Pilot Scale, Domestic Source Separated Organics Collection/Processing Project". These areas were assumed to be largely English-speaking to allow promotion materials in English only. Participants were asked to separate all non-liquid food scraps and trimmings, and all yard waste including brush and clippings less than 3 inches in diameter.

Metro is in the process of compiling a final report on the project, but no details of the results were available at the time of preparing this document.

The overall goals of the demonstration were:

- to determine whether participation rates and quantities recovered are sufficient to justify widespread residential wet waste collection,
- to evaluate the ability of residents to put appropriate, uncontaminated wet waste out for collection, so that a usable product may be produced and,

- to identify an effective container system that encourages participation and allows participants to distinguish wet waste from garbage.

Food Waste Collection Systems

In-house collection containers that were tested include:

- a "kitchen catcher" unit which was used to hold green plastic bags (bags are also supplied); and

- a wire rack equipped with a lid, which was used to hold plastic grocery bags.

Plastic pails were being used as outdoor containers, ranging in size from five gallons in one collection area, to 13 gallons in another. All organic material set out at the curb for collection was being picked up with either side loading or rear loading packer trucks.

Wet Waste Processing

Compostable material collected from the three collection areas was delivered to the former Experimental Resource Recovery Plant in Downsview, at the Dufferin Transfer Station site. It was composted using the Fairfield-Hardy digester unit that was already in place and was modified for this project.

Material was off-loaded from the packer trucks, and large bundles of brush were pulled from the piles, either manually or with a small skidsteer loader. The remaining material was loaded onto an incline conveyor which fed into a custom designed bag breaking machine. With the use of a trommel screen, and a magnetic separator, oversized materials and other contaminants were separated from the rest of the organics.

The remaining material was transported to the digesting unit, where it was processed for a period of seven days. At the end that period, the partially composted material was discharged and transported to outdoor, aerated storage bunkers, where it was kept for about eight weeks, before being screened and moved to a curing pile.

Preliminary Findings

- weekly set-out rates were low in the first few months, at approximately 30%

- Of the households that were participating, generation rates were comparable to those found in the Guelph Wet/Dry demonstration (Nash, CMA, 1993).

Areas of Further Research

- The University of Guelph was conducting growth tests on some of the finished compost produced by the Metro Toronto program. The results of the tests were not available at the time of preparing this document.

- Attitudinal and participation studies have been conducted in each of the three study areas. The results were not available at the time of preparing this document.

- A comprehensive final report describing the results of all aspects of the demonstration is currently being compiled (Ariganello, 1993).

City of Mississauga

Description of System (Proctor & Redfern, 1992a, 1993)

Launched in October 1991, source separated organics were initially collected from a high-rise building, kitchens of Mississauga General Hospital, and four garbage collection routes. A total of 3,000 households were involved in the demonstration project. A final report was being compiled at the time of preparing this document (Rivers, City of Mississauga, 1993)

The primary objective of the Mississauga wet/dry demonstration project was to test a variety of collection systems for source separated organic wastes and to try to identify which collection system might strike the best balance of cost effectiveness, convenience and potential for waste diversion and high compost quality.

Four combinations of storage and collection systems were tested, including two 2-stream and two 3-stream systems. The following is an outline of the different combinations of indoor and outdoor collection containers that were tested:

Two Stream Containers

Pilot Test 2A	**wet**	plastic container (indoors), bucket with lid (at curb)
	dry	"super cart" - larger version of the blue box with a lid and a wheel
	garbage	residents' choice

To streamline the research efforts of the various wet-dry demonstrations, the collection route where householders used rigid containers for material storage, was dropped in the fall of 1992.

Pilot Test 2B	wet	residents' choice (indoors), plastic bag (at curb)
	garbage	residents' choice

Three Stream Containers

Pilot Test 3A	wet	residents' choice (indoors), plastic bag (at curb)
	dry	blue box
	garbage	residents' choice
Pilot Test 3B	wet	paper bag (indoors), paper bag (at curb)
	dry	blue box
	garbage	residents' choice

A second objective was to demonstrate composting of food and yard wastes using outdoor turned windrow technology. The day-to-day operation of the site was contracted to Compost Management Associates and was similar to the system that was employed at the Halton demonstration.

During the first year of operation, about 1,000 tonnes of organic material were collected within the various study areas and delivered to the site for composting. For the period from March to December, yard waste represented about 75% of the material collected at curbside (Nash, CMA, 1993).

Finished compost has been tested against and has met the Ministry of Environment Compost Quality Guidelines. Approximately 50 m^2 of finished material was distributed at public giveaway days, another 150 m^2 were used by the Mississauga Parks and Recreation department. About 300 m^2 were sold to a local nursery for $3.00 a cubic meter (Nash, CMA, 1993).

Findings

Some of the findings from the first year of operation include (P&R, 1992a, 1993, Nash, CMA, 1993):

- no single collection approach was identified that seems ideal or suitable for recommendation for a city-wide roll-out;
- diapers/sanitary napkins did not decompose along with organics (and therefore should not be included in collection).

- *Compost quality*

    - finished compost from the two-stream collection routes met MOEE guidelines for compost quality, but tended to be highly contaminated with inorganic contaminants, despite very intensive hand-sorting of the incoming feed materials (this is not a sustainable approach to production of first-quality grade of compost);

    - "sharps", including pieces of razor blades and hypodermic needles were found in screened finished compost from a 2 stream route. This indicates that screening alone cannot be counted on to recover all types of contamination.

- *In-house and curbside collection containers*

    - kraft/cellulose paper bags were preferable in the composting process because mechanical debagging technology is not yet available. The major disadvantages of using paper bags are that they are bulky in storage, have a high per unit cost, and effective methods to distribute them to residents have not yet been identified;

    - in comparison, plastic bags are cheap, and easily available, although they pose considerable problems for debagging of materials;

    - reusable containers work well, but residents need intensive education to prevent them from lining the containers with plastic bags.

- *Collection*

    - brush and Christmas trees should be collected separately from other organics because of the difficulty in separating this material from other organic wastes;

    - it is best to start with a limited number of materials (e.g. yard and food waste), work out the bugs and then add more materials (e.g. paper products). Halton did this and had less problems with contamination than any other wet/dry programs;

    - the driver of the collection vehicle plays an essential role in rejecting bags that are grossly contaminated;

- collection contracts should be structured to reward contractors for hauling the maximum amount of clean organics to the composting site, and to discourage them from bringing in contaminated organics (e.g. the contractor should haul residue from the compost site and pay the city a weight-based residue penalty).

- *Diversion*

  - during the winter, the average daily receipt of waste was as low as 2.2 tons. During the spring, this rose to as high as 16.5 tons.

  - available data indicate diversion rates of approximately 35% for the three-stream system and between 17% (not including recyclables) and 40% for the two-stream system (Proctor and Redfern, 1992a, 1993).

Residential promotion and education

- intensive promotion and education is needed to produce good, consistent and widespread participation (this is a problem inherent to all other wet/dry demonstrations) (Nash, CMA, 1993);

- participation rates tend to be about 50% and are not sustained (they drop after a period of time) (Nash, CMA, 1993);

- residents need some form of direct feedback, especially concerning contamination. The approach should be similar to leaving unacceptable materials behind in the recycling container with an explanatory note (Nash, CMA, 1993).

City of Guelph

Description of System (City of Guelph, 1991, Laird, City of Guelph, 1992, 1993, Nash, CMA, 1993)

Research in the City of Guelph was initiated in 1989, with 565 single-family households participating in collection trials. The test area was later expanded to include total of 872 households.

The test area was used to measure the variation in diversion and householder acceptance rates for an initial 5 different collection scenarios that include:

3-Stream Systems

Collection Area A:	203 households
wet	green bins - wheeled cart (120 l)
dry	blue bins - wheeled cart (240 l)
garbage	regular garbage cans/bags

Collection Area D:	185 households
wet	green bags (translucent, 30 x 36 inches)
dry	blue bags (translucent, 30 x 36 inches)
garbage	regular garbage cans/bags

2-Stream Systems

Collection Area B:	177 households
wet	green bins
dry	regular garbage cans/bags

This version of the 2 stream system was dropped from consideration due to higher contamination rates and less public acceptance than other systems.

Collection Area C:	131 households
wet	green bins
dry	blue bins

Collection Area E:	129 households
wet	green bags
dry	blue bags

Collection

Each stream was collected using a separate collection vehicle. Those streams collected in plastic bags were collected using a one-side side loading packer truck. Streams stored in bins were collected with a two-side side loading packer truck, equipped with side-mounted hydraulic lifters.

Wet Waste Processing

Wet waste was being composted at a 10/tonne/week plant located at the Guelph landfill. This plant was specifically constructed to handle the material generated through the demonstration project.

The facility is a hybrid, combining features of a static aerated pile and an in-vessel reactor. A range of experimental techniques were used to develop a

method of removing plastic bags and other contaminants from the organic stream. (results were not available at the time of preparing this document).

Dry Waste Processing

No report has yet been made public regarding the sorting system for the pilot study dry stream.

Findings

Findings made available to date are as follows:

- while the clean organic and clean dry streams of a 3 stream system exhibited lower contamination rates, 58% of the material found in the garbage stream was either compostable (25%) or recyclable (33%);

- although the capture rate for compostable and recyclable material in a 2 stream system was higher than that found in a three stream system, materials recovered in the dry stream were more contaminated. This might have affected their marketability.

Diversion Rates

- Overall, results from the pilot study indicate that 60-70% of residential waste material could be diverted:

  - the 3 stream system diverted 61% from landfill;
  - the 2 stream system diverted 69% from landfill.

Quality of Compost

- Finished compost produced from both streams was tested against MOEE interim guidelines published in Nov., 1991 (Laird, 1992). The 51-week averages consistently met the criteria for which tested. Testing against the full set of criteria was continuing. The results of tests against the full set of MOEE compost quality guidelines were not available at the time of preparing this document.

Quality of Dry Recyclables

- the 3 stream system produced a slightly higher quality of recyclable materials than the two stream system. In the 3 stream system, approximately 98.5% of materials were uncontaminated

and marketable while in the 2 stream 92.5% were uncontaminated.

Bins vs. Bags

- 75% of the households using bins as collection containers found the wet/dry program to be more convenient whereas only 51% of those households using plastic bags found wet/dry to be convenient.

Future Plans

Due to the potential for higher recovery rates, lower estimated municipal and private sector costs, and improved program flexibility, the City of Guelph has decided to adopt the two stream approach for city-wide roll-out.

For the city-wide roll-out of this program, Guelph plans to utilize a two compartment vehicle to enable both wet and dry streams to be collected at the same time. Research is underway to develop a collection vehicle to suit these needs. Guelph is also investigating a hydraulic mechanism which incorporates a dynamic weigh-scale to allow for implementation of a direct cost system based on weight, not volume.

Certificates of Approval have been obtained from the Ministry of the Environment and Energy, though construction of the full scale facility for composting and for processing recyclables has not begun at the time of preparing this report. The organic waste facility is expected to be designed to handle all residential and most IC&I wet wastes.

Areas Requiring Further Research/Information

Several questions about a wet/dry collection and processing system remain to be answered, Some of the issues include:

- analyses of the time required and cost of sorting 2 stream vs. 3 stream;
- testing of co-collection options and costing;
- integration of backyard composting into the program;
- debagging technologies;
- how to manage HHW;
- up front mechanical preparation of organics; and
- program implementation in multi-family and IC&I.

District of Lunenburg (LURA Group, 1993)

The Municipality of the District of Lunenburg and the towns of Bridgewater, Lunenburg, and Mahone Bay conducted a pilot Wet/Dry program from September, 1992 to mid-February, 1993.

A three-stream approach was adopted for the pilot program. It covered 982 households in all four municipalities. The wet stream included kitchen and yard waste. Roll-out carts (Compostainers) were provided for the organics stream. Blue Bags were used for commingled recyclables - tin and aluminum containers, glass, ONP, PET soft drink containers and plastic shopping bags. Weekly collection was provided in the towns and bi-weekly collection was provided in the rural areas as is regular garbage collection.

A high participation rate was achieved. 70% of residents reported setting-out organics for curbside collection. 60% of those not using the carts reported using backyard composters instead. 90% of residents set-out recyclables in the Blue Bags at least monthly.

Contamination of recyclables was approximately 30%, reportedly mostly related to incorrect set-out plastics. However, broken glass in newsprint was also a problem. The organics stream was reported to have little contamination.

Diversion of organics was reported to be 27% while diversion of recyclables (recorded only from mid-October to mid-December) was reported to be 7%. It was estimated that backyard composting diverted an additional 5% of the waste stream.

During the winter months waste generation was reduced. This was noted in all streams, particularly in the organics stream due to lower yard waste generation. Freezing of organics in the roll-out carts was experienced but was not considered a problem during the course of the pilot.

From the surveys (three were conducted, at the beginning of the project, after phase 1 in the fall, and after phase 2 in the winter) high acceptance by participants was indicated. 85% reported that the program was "above average" while 2 in 3 residents preferred the system to regular garbage collection.

Table E.1 summarizes available data on a number of wet/dry projects (two, three and four stream).

Table E.1

Summary of Selected Wet/Dry Project Information

Study Area	Pilot	Materials	Programme	No. Hhlds Served	Date Started	Total Waste Generated (kg/hh/yr)	Reported Recovery Rates: Dry Stream: Total Dry Collected (kg/hh/yr)	Dry Stream: Dry Recyclables Collected (kg/hh/yr)	Wet Stream: Total Wet Collected (kg/hh/yr)	Wet Stream: Compostables Collected (kg/hh/yr)	Reported Participation Rate (%)	Reported Diversion Rate (%)	Comments	Ref. No.
Guelph, Ont.	√	Wet - food, yard, wet paper Dry - Blue Box, paper, boxboard, rigid plastics, film plastic, PS, other metals	2 - Stream (avg.)	491	Jun-89	1092	561	289	531	443	95	68	32 to 48% of mtls recovered in dry stream not currently recycled - recovery rates don't incl. these. Study incl. 47 Ontario subsidized townhouse units - not incl in these data. Processing facility approved - 125,000 te/yr (40,000 te/yr wet)	1 & 2 & 3
	√	As Above	3 - Stream (avg.)	334	Jun-89	1050	328	224	391	378	95	61	2-stream recovered higher percentage of recyclables than 3-stream. 3-stream recovered higher quality of recyclable materials than 2-stream. Also 3-stream recovered cleaner wet waste	1 & 2 & 3
Halton, Ont.	√	Wet - food (fruit/veg, dry & fish), yard Dry - BB, paper, other metals, rigid plastics, film plastics, PS, aseptic, clothes	3 - Stream	582		1266	442	399	277		wet stream - 40% curb, 17% curb & BYC, 33% BYC only	42	Recovery rates for periods when all materials collected - expanded BB, food and yard waste. Capture rates obtained from Composition analysis of third bag. Diversion does not incl. BYC. Recovery of wet waste incl compostables not requested.	6 & 7
Lunenberg, NS	√	Wet - food (except meat), wet paper, yard Dry - Fe & Al cont., PET, film, ONP, glass	3-stream	982	Sept. 1992 - Feb. 1993				not available		85%	30% - 23% org, 7% recycl (+ 5% BYC)	Initially planned as two-stream. 60% used BYCs. Participation measured by survey. Only 30% recyclables not recoverable due to contamination (mostly attributed to incorrect set-out of dry wastes and broken glass with ONP). Freezing occurred in carts.	9
Metro Toronto, Ont.	√		3 - Stream	14,700	Nov-91 One-year pilot	Results not available - report currently being compiled by Metro Works and R Cave & Assoc. Section with recovery rates and participation data may be available by end November					initially 30%		Based on tour of European prgrms, preferred 3-strm. Survey (20% resp) cited use of BYC as most frequent reason for non-participation	8
Mississauga, Ont.	√	Wet - Kitchen (incl meat/dairy), yard, ashes, tissues, diapers, animal droppings Dry - BB	2 - Stream (wet bin)	955	Oct-91	1421	264	253	316	310	35	40	Final report on Mississauga currently being compiled - available end November, 1993.	4 & 5
	√	Wet - as above, incl papers eg boxboard, mixed paper Dry - BB	2 - Stream (wet bag)	917	Oct-91	1239	data not available	data not available	219	206	44	Wet - 17% Dry - not available	Participation rates are actually average set-out rates	4 & 5
	√	Wet - Kitchen (incl meat/dairy), yard, tissues, animal droppings Dry - BB	3 - Stream (avg.)	1,829	Oct-91	1417	239	229	269	259	37	35		4 & 5
Essex, Ont.	prop'd pilot		3-stream and, 2 strm + BYC/organics drop-off	500 and 250									BYCs will be distributed to all hhlds in second test area which will be designed to encourage home composting of food and yard waste	3
Markham, Ont.	prop'd pilot	Wet - Kitchen and yard waste Dry - ONP, OMG, OCC, Boxboard, mixed paper, glass cont., fe & al cont., scrap metal, plastics, textiles,	3-stream	2,403 res and 54 IC&I									Townwide survey indicated 85% of residents favoured exp recyclables collection and 79% willing to separate food waste for BYC or curbside collection. Acceptability to be tested in 1-yr pilot. Collection from residential & IC&I sources	10
Newmarket, Ont.	prop'd pilot		3-stream										No details available. Canada Compost Ltd. proposed pilot. Anaearobic digester will process organics	15

Table E.1

Summary of Selected Wet/Dry Project Information (cont'd)

[illegible]	[illegible]	Wet: food, soiled paper, [illegible] paper, diapers, yard. Dry: glass, metal, [illegible] plastic [illegible]	[illegible]	35,[illegible]	No data Available								[illegible] 40% participation [illegible] Expect [illegible] program [illegible] The city expects to generate [illegible] tonnes/day of compostable materials.	14
[illegible]	[illegible]	Comp: food, [illegible], diapers, tissues, sanitary prod., soiled paper, pizza boxes. Dry: glass, [illegible], metal cont., some plastic [illegible]	3-stream with wet bag for compostables	300	Mar-92	1229	425		355		64%	63%	90-day pilot. [illegible] Yard waste [illegible] during winter added to compost. High degree of promotion to residents. [illegible] compost not indicated.	[illegible] & 11
[illegible]	[illegible]	Comp: food, [illegible], diapers, tissues, sanitary prod., soiled paper, pizza boxes. Dry: glass, [illegible], metal cont., some plastic cont.	3-stream with wet bag for compostables	183	Mar 92	993	520		264		94%	81%	90-day pilot. Yard waste [illegible] winter added to compost. High degree of promotion to residents. [illegible] material in compost not indicated.	[illegible] & 12
[illegible], NY	[illegible]	Wet: food, soiled paper, paper pkg.	3-stream	150	Sep 92				54		83%			3
[illegible], MN		Wet: kitchen (incl. meat, dairy), tissues, animal droppings, disp. diapers, paper (waxed or [illegible]) [illegible] Dry: [illegible]	3-stream	250	198[illegible]				239		95%+		compostables are 64% of non-recyclable stream	3
[illegible], MN		As above	3-stream	45	1989				236		98%+		compostables are 57% of non-recyclable stream	3
New York, NY	[illegible]	Wet: food, uncoated paper, food pkg., yard	3-stream	3,200	Nov 91				425-475		not available		Little yard waste collected as predominantly multi-family. Participation difficult to measure as predominantly multi-family.	3
Spring Valley, NY		As above	3-stream	1,000	1989				709		95%+		Half of waste collected is in compostable stream; one quarter in recyclable stream	3
[illegible], MN		As above plus yard in wet str.	3-stream	2,300	May 90				not available		98%+			3
Santa Barbara, CA	[illegible]	compostable materials; details not available	not available	1,400	Apr-93	n/a					n/a	n/a		12
[illegible], Netherland		Wet: 1 for compostables (kitchen & yard, no meat) and another for other wet. Dry: 1 for all fibres and another for plastic & metal containers	4-stream: two, two-compart bins	4,500	May 91			289		321	very high compliance reported		Separate textile collection. Glass is taken to drop-off centres (1 per 500 res.). Problems with contamination of container stream with fibres; unsure whether collection or source sep. problem. Recovery data from 1991	13

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SCHEDULE F

MIXED WASTE PROCESSING

SCHEDULE F
Mixed Waste Processing

Introduction

Mixed Solid Waste (MSW) processing involves collecting unseparated waste at the point of generation, and taking it all to a material processing facility. There, recyclable fractions are removed, processed and marketed, and the organic materials are composted. The residue is sent to landfill.

Some facilities focus particularly on composting while others focus on incineration. Some facilities also process sewage sludge with the mixed solid waste, a practice known as co-composting. A selection of case studies is presented at the end of this Section. A summary of selected programs is presented in Table F.1.

Benefits of Mixed Waste Composting

Proponents of mixed solid waste processing list the following benefits:

- **Simplicity of Collection**
  Waste can be collected in a single truck and does not require source separation. It might be expected that this should translate into cost savings, although this issue is subject to debate due to processing implications (Hammer, 1992).

- **Facility Requirements**
  Rather than having several different processing facilities, this is centralized into a single, co-ordinated venture, which is said to be easier to administer and operate.

- **Development of a Useful Product from Waste**
  Significant portions of waste are reduced in volume. Portions that are landfilled require less volume and help extend landfill life.

- **Increases Recycling**
  By removing the need for residential participation in source separation, and carrying out all separation at a centralized plant, some proponents argue that recovery of recyclables is increased. This too, is subject to debate (Lundell, 1992, Gitlin, 1992, Apotheker, 1991, Hammer, 1992).

Limitations of Mixed Waste Processing

Facility Location	Start-up Date	Throughput (te/day) Des	Curr	Type of Waste	Compost Technology	Enclosed Composting	On-going Odour Problems	Capital Cost ($ million)	Operating Cost ($/year)	Comments
Coffeyville, KS	1991	73	73	Res/Comm	static pile, screen		No - isolated	not disclosed		Only 27 - 36 te/d composted, no presorting
Des Moines, IA	1991	175		Res/Comm	grind, ext. windrow, screen, encl. curing	√	Yes	5.85	not available	
Escambia, FL	Sep-91	228	228	Res/Comm	shred, windrow		No	not available		
Ferndale, WA	Jun-91		227	Res/Comm	digesters, screen, agitated bed, screen, air classifier	√	Yes	10.4	not available	Composting approx 100 te/d, no markets for compost yet 40% residuals
Fillmore Cty, MN	1987	27	23	Res/Comm	shred, windrow, screen, ext. curing		Yes - No major - frequent turning	1.91	390,000	covered pad under construction Receive source separated res organics; 40% residuals
Hidalgo Cty, TX	Feb-91	273	64	Res/Comm	shred, gyroscopic mill, windrow		No - isolated	1.95	146,000	Contamination a problem - considering additional pre-sorting equipment - $325,000. Also County begun collecting glass, rigid plastic and ONP
Lake of the Woods Cty, MN	1989	77		Res/Comm	shred, windrow, encl screen, encl curing	√	Some - isolated	0.78	338,000	use compost as landfill cover. 1992 BioCycle survey reports 5 tpd throughput
Lakeside, AZ	Aug-91	13	10	Res/Comm sludge	digester, aerated windrow, moisturize, screen	√	Yes	0.95	not available	compost sold as potting soil; 30% residuals but no market for recyclables
Mora, MN	Jul-91	191	150	Res/Comm	shred, encl. static pile, screen, ext. curing	√	Some - fans/biifilter	14.3	1,690,000	high-tech sorting
Newcastle, DE	1984		205-R/C 205-S	Comm- 10% Sludge	shred, co-compost digesters, 25% cured/75% not	√	Yes	101.4	39,000,000	temporarily shut down due to odour. 50% compost marketed as topsoil, 50% as fertilizer
Pembroke Pines, FL	Sep-91	600	500	Res/Comm	aerated windrow, hammermill, screen, destone	√	Yes - biofilters problems, need additional aeration	63.1	not available	Currently class B compost; 20% residuals
Pennington Cty, MN	1985	70-75	36	Res/Comm	windrow,		N/A	1.69	not available	operating at 36 te/day, 10% residuals, 45% RDF
Portage, WI	1986	15	15	co-compost	co-compost in rotating drums, other compost	√	N/A	1.3	130,000	bulk of compost used as landfill cover; 20 - 25% residuals
Portland, OR	Apr-91	546	closed	Res/Comm sludge	windrow, encl. curing, screen	√	Yes	39	9,555,000	odour problems and costly retrofits caused bankruptcy
Sevierville, TN	Sep-92		136-R/C 22-S	Co-compost	digester, aerated windrows	√	Initially; resolved			Use large hoods over windrows, 20 - 25% residuals prior to screening
St. Cloud, MN	1988	91	45	Res/Comm	agitated bed, screen, destone, curing	√	Yes - wet scrubber, biifilter	48.75	1,300,000	165 te/d feed, 120 te/d to RDF, 45 te/d composted. Odour problems caused change from windrow to in-vessel
Sumter Cty, FL	1988	55-65	46	Res - 80% Comm - 20%	shred, windrow, screen		No - Very Rural	2.6	650,000	now only receiving 29 te/d a· waste being taaken elsewhere; 25% residuals
Swift Cty, MN	1990		11	Res/Comm	shred, aerated windrow, screen		Some	2.21	338,000	Erected hanger and purchased windrow turner - $425,000
Truman, MN	Aug-91	77	50	Res/Comm	shred, aerated/turned in-vessel, aerated static pile, grind, trommel	√	Yes - disguise with citrus oils	11.18	2,028,000	some concern re. PCB levels
Wright Cty, MN		109	100	Res - 60% Comm - 40%	aerated windrow	√		18 - 20		Operates at 82 te/day in winter. Receives source sep res organics + org. mtl from another facility Compost used for Hwys/golf crs/cemeteries. Curbside recycling exists but still pulls recyclables; 35% residuals

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4. Additional data on Newcastle facility: personal communication with John Neyman and Rebecca Roe, Raytheon, March and April, 1993
5. Additional data on Sevierville : personal communication with J. DeMoll, General Manager, Sevierville, March, 1993

Notes:

1. Hidalgo operating cost based on $9/ton reported, 50 tpd throughput and assumed 250-day operation
2. Truman facility operating cost based on $72-75/ton reported, 85 tpd throughput, and assumed 250-day operation
3. Portland facility operating cost based on $49/ton reported, 600 tpd throughput and assumed 250 day operation

The majority of mixed waste composting programs currently operating are experiencing a number of difficulties. The main problem, according to experts, is that facilities need to perform three tasks (Apotheker, 1991a, CMA, 1992, Goldstein, 1992, 1992a):

- facilitate recycling;
- Separate organic materials from inorganics;
- Separate recyclables from other materials (and particularly from potentially hazardous components of the waste stream).

In many cases some, or each of these tasks are not performed adequately. This results in low recovery rates, poor quality recyclables and low grade compost. Specific problems encountered by some facilities include the following:

Odour

Most mixed solid waste processing plants that compost organics at some time have been forced to counter odour problems. Odours at composting plants result from the biological activity associated with decomposition of organic materials. For some, such as the Portland, Oregon, Reidel facility, this has been one of the factors which contributed to their closure (CMA, 1992, Goldstein, 1992, 1992a).

In some cases, with careful monitoring and improved operation, odours may be mitigated. The Columbia County, Wisconsin facility has experienced odour complaints related to inadequate turning of piles, and the resulting anaerobic conditions. A new windrow turner was purchased to correct the problem (Goldstein, 1992). In other cases, expensive equipment has been required, which has not always solved the problem (CMA, 1992).

Contamination

MSW processing involves pulling off recyclables (either manually or mechanically) from other materials that must be landfilled, and then, sending the balance to the composting process. Contamination of finished compost is a problem. While plastics, paper and glass can often be screened out to a degree, other undesirable or toxic materials (either from household hazardous wastes or from other wastes) may break through.

Given the potential markets for compost (i.e. garden use etc.) it is critical that a safe and reliable product be generated. In the US, where guidelines are less stringent than in Canada (Hammer, 1992), several plants have still experienced difficulty with high contamination of composted material.

In Newcastle, Delaware, a new 1/4 inch screen is now used for all material that will be sold. However, to maintain throughput, only 25% of the material can be

screened. The balance is used as landfill cover. Facilities in both St. Cloud, MN and Hidalgo, TE have had to redesign their pocess in response to contamination, including PCBs in the case of St. Cloud (Goldstein, 1992,1992a).

Quality of Recyclables

For a viable recycling strategy, secondary materials must be free of contamination, unbroken (in the case of glass), and easy to separate for processing. For this reason, materials that are commingled with waste produce secondary materials of a lower calibre. A US study showed that MSW facilities report lower recovery rates of materials than do source separation programs (Hammer, 1992). This is particularly true for paper fibres and glass.

The Columbia County, Wisconsin plant became fully operational in March, 1992. Despite recovery of recyclables by haulers who use the facility, a 40% material reject rate has been reported (Goldstein, 1992).

Cost

Municipal solid waste processing and composting plants are expensive to site and to operate. Operations demand a considerable amount of expensive technology and manpower, to ensure proper sorting of materials and management of composting. A US study showed that the average American MSW plant operates at a capital cost of $40,000US to $80,000US per ton of daily capacity (Apotheker, 1991a). Plants must be designed to accept and manage all of the waste generated in the community, rather than only a portion. This requires complicated machinery, and a much larger facility.

Also, given the on-going operating problems experienced, and a general tendency to add capital improvements to solve the problems, costs can be become prohibitively high. Hidalgo County, Texas was investing an additional $250,000 in equipment to counter problems with plastic contaminants in the finished compost. The site was not fully functional, and markets for the material were not secured (Goldstein, 1992).

Market Development/Standards

While it can be difficult to market any type of compost, consumer acceptance of MSW compost is lower than acceptance of composted green waste, due to real or perceived quality differences (Hammer, 1992). A study completed in the Netherlands showed that farmers using mixed waste compost noticed a decline in sales (Segall, 1992). They also noticed a high level of physical contamination in fields (e.g. glass and plastic) following heavy rains.

Ferndale, WA has been operating for approximately 18 months and has yet to market any material, as the compost is still undergoing testing, with process control adjustments being made (Goldstein, 1992a). The Columbia County, Wisconsin facility is currently landfilling its final product, pending state approval to undergo another two years testing of land application (Goldstein, 1992a).

Another approach to MSW processing involves separating combustable waste for processing into refuse-derived fuel (RDF) pellets. A key problem with the approach lies in identifying markets for the RDF pellets (Misner, 1990).

Impact of MSW Processing on Other 3Rs Activities

Reduction, Reuse and Recycling are linked with the common requirement of education and participation. A system in which waste is simply mixed and collected removes these elements. Individuals are not readily encouraged to take responsibility to reduce waste, either through buying recyclable containers, reusing materials (where possible) or reducing waste.

By commingling waste and recyclables, previously clean organic and recyclable material becomes contaminated with inappropriate and often toxic materials.

Municipalities are often required to commit to providing a certain amount of garbage or paying a penalty for the portion not delivered because MSW facilities are expensive to site and operate. Portland, Oregan was contactually obliged to pay for at least 185,000 tons of garbage per year for using the Riedel MSW facility (recently closed) (Apotheker, 1991). These "put or pay" contracts can be disincentives for communities to encourage waste reduction.

Siting Facilities

Both Dade County, Florida (Agripost) and Portland, Oregon (Riedel) facilities were sited in locations arousing concern among residents which contributed to their closure. Other facilities near residential areas also have experienced complaints.

Applicability to GTA

At present the waste diversion potential of this strategy in the GTA context would be limited for the following reasons:

Contradicts Provincial Policy

- the MSW approach conflicts with the 3Rs focus of existing waste management policy and practice. The end-of-pipe strategy promotes an "out-of-sight, out-of-mind" attitude that would discourage 3Rs;

- Similarly possible obligations to provide minimum quantities of waste may be structural disincentive for communities to encourage waste reduction, contrary to the present approach in Ontario;

Erodes the Current Infrastructure

- the MSW approach would require dismantling the current recycling infrastructure, which has been developed over several years and is at the point of operating effectively. This is considered a costly step backwards;

Quality of Materials Diverted

- Recyclables recovered from mixed waste programs require more effort and cost to process to a state suitable for marketing. The quality of recyclables diverted through source separation programs will always be higher than those which are mixed with other wastes, particularly wet organics.

- Similarly, finished compost is often contaminated with materials such as glass, plastic and household hazardous waste. This contamination is difficult and expensive to manage in a mixed waste system. Compost quality is better controlled in a waste management system that includes source separation;

Case Studies

Examples of Successful Mixed Waste Composting Programs

A successful Mixed Waste Composting Program is defined, for the purpose of this study, as a program that has been operating at least one year, has had no unmanageable problems and is producing a compost that can be marketed (through free distribution or sales).

A telephone and literature survey showed that very few plants currently in operation should be termed an unqualified success. Most plants appear to be in a "grey area" where they have not yet demonstrated success and are experiencing on-going problems. However, the number of proposed facilities and facilities under construction has decreased over the previous year. Examples of current operations that are attempting to overcome difficulties are discussed below.

Wright County, Minnesota
(Goldstein, 1992a, Davis, Wright County, 1993)

The Wright County, MN MSW plant is relatively new, having started up in February, 1992. Capacity is 120 tons/day, averaging 90 tons/day in winter. In order to maintain the high presence of organics, a trading arrangement has been struck where the neighbouring Anoka County provides required organic materials in exchange for receiving Wright County's plastic and paper materials for their RDF plant. Of incoming materials, 68% is estimated to be from residential sources, with the additional 32% from IC&I sources.

Finished compost is marketed to the State Highway Department and various Golf Courses and Cemetaries. It is marketed as "Class A" unrestricted material, although some concerns with PCB content have been noted. This program utilizes an extensive sorting procedure (a combination of manual and mechanical techniques) which separates the aluminum, glass, newspaper and some plastic, OCC and magazines from the compostable materials. Approximately 8% of feed is recovered for recycling (steel, aluminum, OCC and PET), 36% is rejected, much of which is to be sent for incineration, and 58% is composted. Approximately 2% of finished compost is rejected.

New Castle, Delaware
(Goldstein, 1992, Neyman and Roe, Raytheon, 1993)

A public/private, in-vessel composting plant with a design capacity of 1,000 tons/day has been operated by Raytheon in Newcastle, Delaware since 1984. It was recently shut down for retrofits.. The plant was co-composting between 200 and 225 tons/day processed MSW with 100 to 150 wet tons/day sewage sludge. The majority of incoming waste (up to an estimated 90%) is said to be from residential sources.

MSW feed is extensively sorted with a mechanical separator. Organics are processed in Fairfield digesters, and then cured in a large curing area. 25% of the approximately 250 tons/day output are screened (in a 1/4 inch screen) and distributed as compost. 75% of material is not screened (due to lack of screen capacity) and is utilized in landfill as cover.

600 tons of the daily feed is sent to Pennsylvania for incineration, while 30 tons per day of steel are sold for reprocessing. It is anticipate that 3 to 4 tons of aluminum will also be recovered. An additional 1,000 tons/day material is collected and immediately sent to landfill, unprocessed. A "minute" portion (not estimated) of glass is also sent to landfill.

Compost has been marketable, selling at at a cost of $4.50 per cubic yard (bulk) or $1 per 20 lb bag. Approximately 50% of the marketed material has been distributed as topsoil, and another 50% has been pelletized for fertilizer. The program has utilized advertising, public education, plant tours and other venues to distribute and create demand for the material. The Department of Transport was considering utilizing a significant amount of the compost in land reclamation and building projects.

The plant has experienced odour problems, contamination and other product specification problems (excessively dry compost). The potential for improved screening to reduce contamination was limited because this contributes to odour problems. It could only be done when the wind blew in a certain direction. Adding moisture to the piles also generated further odour problems. Odour complaints related to the digesters are being addressed now (with consideration given to a new stack, fan, and neutralizing agents).

Pembroke Pines, Florida
(Goldstein, 1992 and 1993)

Pembroke Pines, a public/private venture, has been operational since October 1991. It is the largest MSW composting facility in the US, owned by Reuter Recycling. It currently processes 550 tons/day, or at about 80% of its design capacity of 660 tons/day.

A preprocessing stream separates 10% of material for recycling, another 20% for landfill, and the remaining 70% for composting. Ultimately, approximately one third of the incoming material becomes finished compost, which is currently distributed as Class B compost, and used in soil blends, on sod farms, and as top dressing. According to plant sources, virtually all compost is marketed.

The plant has experienced problems including:

- slow decomposition due to high temperatures caused by anaerobic conditions
- high equipment maintenance demands (parts of the hammermill are subject to wearing out)
- too little air in the piles between November and Summer. This is due to a structural/engineering problem that has set the aeration below the groundwater. During these months, composting is halted, and a major reconstruction project is being planned to fix the biofilter process.

With a secondary curing pad and reconstruction, plant representatives believe a Class A compost rating could be achieved (as the product cures longer and achieves greater stability). Additional improvements under consideration include additional biofilter to improve aeration of piles.

Sevierville, Tennessee
(Goldstein, 1992a, DeMoll, 1993)

The Sevierville, Tennessee facility began operation in Setember, 1992 and appears to have built on lessons from preceding experiences in MSW composting (Goldstein, 1993). It is discussed here briefly because of its early successes.

The plant is built to a design capacity of 160 tons/day, of which 75% is collected from the IC&I sector, and 25% is residential. OCC is source separated and does not enter this stream. Organic materials are co-composted with 25 tons/day sewage sludge. Large items are manually separated at the front end (bicycles, tires, etc.) and all other materials are sent to the digester. Ferrous is separated off with a magnet, and an aluminum separator was to be installed.

Prior to composting, 35% of incoming material is landfilled, 3 to 4% of the incoming stream which is ferrous material is recovered and an additional 2% is aluminum and was expected to be separated as well. The remainder is co-composted. Currently, 10% of the finished material is required for landfill cover. Most of the remainder, which is a Class A (Agricultural Grade) compost is given away to residents or sold in bulk to landscapers or soil mixers (DeMoll, 1993).

Examples of Failed Mixed Waste Composting Programs

Portland, Oregon
(Reid, 1993, McConaghy, 1993, Apotheker, 1991)

The Portland (Riedel) MSW composting plant was designed to accept approximately 600 tons of mixed municipal solid waste per day, and to convert 60% of that to compost. The facility, which opened in 1991, was the first large-scale mixed solid waste compost plant in the US. It was closed at the end of 1992 because the company was unable to provide the financial resources required to obtain the technology to mitigate odour problems.

The odour problems began at the outset, when the company accelerated the start-up process, forced to accept larger quantities of material than is considered sound at the beginning of a complex biological and technological process. From that point, odour concerns were never properly controlled, resulting in closure.

Also, the operation experienced difficulty meeting its contract of recovering 5% of material for recycling, including successful marketing of the materials (Apotheker, 1991).

It should be noted that other technical problems had been experienced that are attributed to applying the wrong technology to this particular waste stream. For instance, plastic materials processed in the drums became mangled and twisted into plastic "snakes," which caused mechanical problems and additional wear on the machinery.

Dade County, Florida
(Libbey, 1991)

Siting for the Agripost, Dade County, FLA mixed waste composting plant was approved in 1988. In May, 1991, the facility was closed. The former Chief Operating Officer of the plant attributes its demise to a combination of political, financial and technical issues.

The facility was built on a small capital budget based on projected financial statements. This budget pivoted on a low county tipping fee and was barely adequate to sustain the facility. There was insufficient capital to permit facility officials to address technical problems and project financing did not accommodate the uncertainties inherent in a pioneer project. This demanded near immediate full capacity functioning of the plant (at a large design capacity of 800 tons/day) which was not technically sound.

Accelerated start-up and weather conditions exacerbated odour problems. These are likely to have been compounded by new cell development at the landfill next door. Situated across the street from an elementary school and surrounded by a residential community, the operation had little flexibility. Agripost officials failed to win public opinion.

While Agripost did market finished material, the actual output of compost was slow. Partially finished compost was stockpiled, awaiting finishing in the trommel screen. Expensive retrofit equipment was needed to address technical problems (trommel screening equipment, new design for comprehensive duct work system to process air from the building, biological filtration and chemical scrubbing) but financing to complete the retrofits was difficult to obtain.

Attempts were made to obtain retrofit financing from lending institutions (contingent upon a favourable political decision regarding the county tipping fee) at the same time as the facility was brought before County Commission Hearings about health and safety. A decision was made to close the plant.

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SCHEDULE G

SOURCE REDUCTION AND ADDITIONAL WASTE DIVERSION MEASURES

SCEDULE G-1
Source Reduction

Introduction

Source reduction includes those measures that reduce materials that have the potential to become solid waste before they enter the solid waste stream.

In strict terms, source reduction should not permit any waste residual to be produced at any time; however, variations in this concept exist. These variations seem to depend on the philosophy and mandates of the governing jurisdiction. For example, U.S. jurisdictions support a more flexible/lenient version of source reduction than Canadian jurisdictions. In the United States activities such as direct cost, backyard composting, product toxicity and landfill bans constitute source reduction activities. In Canada, direct cost systems and landfill bans, generally, are not considered acceptable source reduction initiatives; however, reuse activities (which extend the life of a product but eventually end up as a waste material) are gaining acceptance as a source reduction activity.

Definition of Source Reduction as Related to GTA

- reduction in product volume and packaging;
- increasing product life and durability;
- promoting product redesign to encourage repair;
- purchasing products selectively to reduce product/packaging consumption;
- promoting reuse of products through refillable packages, reuse centres, garage and rummage sales;
- alternative landscaping such as xeriscaping and grass mulching;
- reducing the volume of junk mail;
- promoting repair/tailoring of appliances, clothing, footwear; and
- reduction of household hazardous wastes.

Reduction Targets In Other Jurisdictions

Several jurisdictions in the United States have established source reduction targets to the year 2000. A summary of source reduction data and opportunities by initiative and material are presented in Tables G-1.1 and G-1.2 respectively. Source reduction targets include 8-10% for New York State, 10% for the State of Massachusetts, and 13.5% for Berkeley, California. In Canada, the Town of Markham, Ontario has targeted source reduction at 15%. These communities are relying on backyard composting to help them achieve the targets. In the case of

Table G-1.1

Summary of Source Reduction Data and Opportunities by Initiative

INITIATIVE	LOCATION	REDUCTION	$ SPENT	HOUSEHOLDS (total/single)	SAVINGS	REFERENCE
Reduction achieved	Berkeley, Cal.	3.30%		43,534/20,128		I.L.S.R., 1992, pg 39
Reduction achieved	Maxville-Kenyon, Ont.	34.00%				GTA Draft, 1993, pg A-54
Reduction anticipated	Rhode Island	10%				SRMG, Feb 1993
Reduction anticipated	Boulder, Col.	3% (cnsrv)				City of Boulder, 1991
Reduction anticipated	City of Blane, Minn.	5%		target 2,000 hlds		comm. Tim Springer
Targeted reduction	New York State	8-10%/1997				EPA, May 1991, pg 4
Targeted reduction	Massachusetts	10%/2000				EPA, May 1991, pg 2
Targeted reduction	Berkeley, Cal	13.5%/2000				I.L.S.R., 1992, pg 39
Targeted Reduction	Markham, Ontario	15%				Lura, Nov. 1992, pg7
Junk Mail reduction	Berkeley, Cal.	1%				I.L.S.R., 1992, pg 39
NAPP- pkg reduction	Canada	7.50%				SRMG, pg 28
Information distribution	Rolling Hills, Cal.	0.84%				RIS, Mr 1991, pg 4-11
Government offices	Itasca County, Minn.	10%		350 staff	1.72 m.t./yr	Minnesota fact sheets
WASTEWISE	Halton Hills, Ontario				109 m.t./15 mths	GTA Draft, 1993, pg A-54
Thrift shops/garage sales	City of L.A., Cal.	1.30%			63,636 m.t./yr	Allaway, July 1992, pg 55
Reuse drop-off achieved	Berkeley, Cal.	1.00%		43,534/20,128	1,037 m.t 1990	I.L.S.R., 1992, pg 33/38
Reuse centre- target	Berkeley, Cal.	2.80%		43,534/20,128		I.L.S.R., 1992, pg 39
Thrift shops	Austin, Texas	0.4/.7%		198,464/112,376	1,712 m.t. 1989	I.L.S.R,1992, pg 16
"Just Say Mow"	Milwaukee, WI	17%	$200,000 US		8,033 m.t. '90	U of Cal., 1991, pg 144
"Don't Bag It"	Montgomery Ct, Oh.		$ 32,000 US		22,272 m.t.	I.L.S.R., 1992A, pg 66
"Don't Bag It"	Plano, Texas	13%	$ 3,000 US			Logsdon, May 1991, pg 74
"Don't Bag It"	Fort Worth, Texas			to 120,000 hlds		R.R, June 1990, pg 20
Grass collection ban	City of Oakville	11% (cnsrv)			$500,000	Jones, City of Oakville
Grass cycle program	City of Waterloo				500-975 m.t./yr	GTA Draft, 1993, pg A-54

Summary of Source Reduction Data and Opportunities by Material

MATERIAL	INITIATIVE	LOCATION	REDUCTION	TIMEFRAME	REFERENCE
Telephone Books	Reduction in paper used	Ontario	15-20%	since 1990	GTA, 1993, pg 8-23
Beer & Soft Drinks	reduction in packaging	US	28%	1970-1988	Garbage, D/J 1993
Secret & Sure Deodorant	reduction in packaging	Proctor & Gamble	1,402 m.t.	one year	Garbage, D/J 1993
Powder Tide, Cheer, etc.	reduction in packaging	Proctor & Gamble	11%		Garbage, D/J 1993
Liquid Tide, Chee, etc.	reduction in plastic pkg	Proctor & Gamble	20%		Garbage, D/J 1993
Cereal	reduction in plastic bag liner	General Mills	12%		Garbage, D/J 1993
Corrugated Cardboard	railway shipping containers	Railway Assoc of Canada	5-10%	100,000 m.t/yr	GTA, 1993, pg 8-23
Cloth diapers	increase use over disposable	Nat. Assoc. of Diaper Ser.	40%	1988-1989	Kashmanian et al., July 1990, 87

Berkeley, California, backyard composting is estimated to contribute 6% to the source reduction target.

Other jurisdictions have implemented programs to promote source reduction with anticipated results significantly lower than what the previosly mentioned jurisdictions have established as arbitrary targets. Three programs are attempting to achieve the following:

- The City of Boulder, Colorado has introduced the term "Precycling" to convey an approach to increase consumer awareness about ways to minimize waste generation through effective changes in shopping/ purchasing behaviour and attitudes. The supporting precycling campaign features in-store promotional and educational activities, school educational programs, and a media launch. These activities, promoting education and awareness, are anticipated to achieve 3% source reduction of the waste stream (Newton, 1993).

- The City of Blane, Minnesota, has embarked on a demonstration program to achieve 5% source reduction through a series of educational programs and activities. Approximately one-fifth of the City's 10,000 households have been targeted to receive printed materials, promotional kits and attend neighbourhood workshops promoting source reduction in the home. The program also involves monitoring of the residential waste stream throughout the study in an attempt to quantify the achievements in source reduction (Springer, 1993).

- Unlike the previous two programs, the State of Rhode Island has expanded its definition of acceptable source reduction activities to include direct cost programs, back-yard and commercial on-site composting, materials reuse, and waste exchange along with public education and consumer awareness programs. Consequently, through these measures Rhode Island anticipates to reduce its waste stream by up to 10% (SRMG, 1993).

Quantities of Waste Reduced at Source

The problem encountered in quantifying source reduction results from limitations of the existing waste measurement system. The measurement system makes it extremely difficult to distinguish source reduction results from other confounding variables or noise, such as illegal dumping in the case of direct cost, sewer disposal of organic matter, and increased recycling activities. Despite

these deterrents, some communities have attempted to quantify program/activity results, including the following:

- Berkeley, California estimates that it currently diverts at least 3.3% of the waste stream through source reduction activities, including reuse centers and drop-off programs, household substitution to cloth diapers, and used clothing stores. Of this, the reuse centres and drop-off program are credited for approximately 1% of the source reduction (City of Berkley, 1992).

- Implementing an aggressive source reduction demonstration program, 25 families within the community of Maxville-Kenyon, Ontario reduced their waste stream by 34%. The study featured workshops attended by one member of the 25 families, backyard composting, and educational literature. The waste stream was measured prior to the study and after to quantify the effects of source reduction on the waste stream.

- In 1989, a survey conducted in Austin, Texas determined that 0.7% of the residential waste stream (.0.4% of the total waste stream) was diverted through reuse clothing centres operating in the city. A similar survey conducted in Los Angeles determined that 1.3% of the total waste generated was diverted through thrift shops and garage sales. Differences in the diversion rates may be attributed to the additional effort taken by the City of Los Angeles to develop and circulate brochures about location and activities of thrift shops in the city (City of Los Angeles, 1992).

- Itasca County, Minnesota tested source reduction activities in the workplace by developing a comprehensive source reduction program for its courthouse and 15 road and bridge department garages (employing approximately 350 staff). Specific source reduction activities included: switching to reusable cups, printer toners, and air filters; reducing junk mail; implementing two-sided photocopying; and using cloth roll towels. These and other measures achieved 10% reduction of the waste stream generated by the participating departments (Minnesota Office of Waste Management, 1992).

- The "Don't Bag It" Lawn Care Plan introduced in the State of Texas emphasizes a variety of approaches to reduce the quantity of leaf and yard waste sent for disposal. Approaches include leaving grass clippings on the lawn, and alternative lawn care strategies. The community of Plano, Texas reported a 13% reduction in the amount of grass going to landfill (Logsdon, May 1991).

Additional Source Reduction Opportunities

Additional opportunities to achieve greater source reduction involve the following activities:

- National Packaging Protocol (NAPP) has targeted 50% reduction in the packaging waste stream by the year 2000 with reduction in packaging contributing 50% of the target (CCME, 1991). This translates into a potential 7.5% reduction of the waste stream by the year 2000 (packaging contributes an estimated 30% to the overall waste stream);

- Berkeley, California has estimated that an educational campaign targeting junk mail could result in a 1% reduction in the waste stream (City of Berkley, 1992);

- distribution of source reduction information brochures can potentially achieve 0.84% source reduction according to a report written for Rolling Hills, California (RIS, 1991);

- the City of Oakville has estimated that its ban on the collection of grass clippings will result in a 11% reduction in the waste stream (Jones, City of Oakville).

Feasible Source Reduction Targets for the GTA

At present, Ontario residents can potentially achieve 5% source reduction of the waste stream which includes a conservative 3.5% reduction in packaging as a result of NAPP initiatives. Assuming that the NAPP target of 7.5% source reduction (25% of packaging, which is 30% of the waste stream) may not be met, a conservative value of half of this target was used. The development of an active educational campaign to further promote source reduction through changes in purchasing habits at stores and changes in lifestyles in the home could increase the level of source reduction by an additional 2-3%. These figures do not take into consideration the effects of a ban on the collection of grass clippings and other yard wastes which could potentially contribute up to 10% reduction of the waste stream, requiring management outside of the home. Based on the above assumptions, it is reasonable to assume that a source reduction target of 5% could be met, measured against a 1992 baseline.

Source reduction at the work place is more difficult to determine due to the different operations of the IC&I sector. Source reduction targets which are easy for one facility or sector to achieve may not be for another. In addition, case

studies focusing on the impact of source reduction on the IC&I waste stream are not well developed. While Itasca County, Minnesota achieved an impressive 10% reduction of the waste stream from municipal operations, it had to implement a comprehensive program to achieve the results. At a minimum, the IC&I sector should be able to achieve 5 to 10% reduction of the waste stream through relatively simple source reduction activities, such as substituting disposable products (mugs, utensils, hand towels) with reusable products, promoting double-sided photocopying, promoting E-mail, etc.

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SCHEDULE G-2
Additional Waste Diversion Measures

Introduction

A wide range of tools exists for enhancing waste diversion from the residential sector. These tools are usually added as an element of an overall waste management plan, and are designed to support existing or planned initiatives. Some of these include mandatory source separation (MSS) and recycling ordinances, as well as landfill bans on wet and/or dry materials.

This section reports experience with four types of residential program enhancements, providing information related to experience in various jurisdictions. The four approaches discussed are:

- mandatory source separation and recycling ordinances
- collection frequency (garbage & recyclables)
- leaf and yard waste landfill and collection bans
- xeriscaping

Mandatory Source Separation (MSS) and Recycling Ordinances

In a program with mandatory source separation (MSS) of recyclables, residents are required to separate designated materials for recycling. MSS is a regulatory measure which can compel waste generators to separate waste requiring disposal from that which may be recovered for recycling, to provide for separate collection of materials. Source separation is described as an effective waste management tool to achieve segregation of recyclable and compostable materials from the waste stream, which can be applied to both the residential and IC&I sectors. (VHB Research And Consulting, 1993) Source separation regulatory measures provide an impetus for citizens to recycle designated materials (ILSR, 1991). In many cases, an MSS program will be linked with other regulatory measures such as material collection and/or disposal bans.

Although mandatory source separation programs appear to be a promising tool in waste reduction, there is not yet a great deal of data that specifically addresses waste reduction achievements that can be attributed to the requirement; however, studies are beginning to address the correlation between participation rates in recycling programs and mandatory source separation/recycling legislation. During the preliminary stages of a study prepared by the Institute for Local Self-Reliance (1993), it was determined that of 45 municipal recycling programs operating throughout the United States, the majority (80%) of those

that had achieved less than 25% materials recovery level were voluntary in nature (ILSR, 1993).

Experience in North American Jurisdictions

MSS has been used as a method to increase participation rates and material recovery rates in Canadian, American and European jurisdictions. According to Steve Shrybman (1989), MSS programs operating in Ontario and Europe can substantially increase participation rates to between 90% and 95%. The following case studies highlight recycling programs that have introduced MSS programs and have reported considerable success with their programs.

Rhode Island Residential MSS program

Rhode Island's source separation program has achieved a reported 90% participation rate. Recovery efficiency rates were estimated based on information received from three jurisdictions (Cranston, East Greenwich and West Warwick) which are as follows:

newspaper	85%
glass containers	45%
aluminum cans	50%
PET and HDPE	75%
organics	95%

The low recovery rate for aluminum cans is attributed to the buy-back program operating in the state (SRMG, 1993).

South-West Oxford Township, Zorra and Midland Residential MSS programs

The Ontario municipalities of South-West Oxford, Zorra and Midland were among the first Ontario municipalities to implement MSS programs. The supporting bylaws stipulated source separation of designated materials and provided enforcement authority through fines and refuse rejection. These municipalities were entitled to refuse to collect non source separated garbage and to issue fines of $2000 for Zorra and $100 for Midland. Since the MSS program, these municipalities have reported participation rates in excess of 90% and that no refuse collection has needed to be terminated (Shrybman, 1989).

Other Contributing Factors

Apart from mandatory source separation legislation, there are other factors that may directly or indirectly attribute to high participation rates and recovery rates. Some of these factors include: the frequency of collection, educational and

promotional programs, community support and involvement, and supporting enforcement procedures. For example, in the community of Babylon, New York, a MSS program has only achieved 63% participation rate; however, this program is not supported by an enforcement program and has a bi-weekly collection schedule (ILSR, 1991). On the other hand, Hamburg, New York, boasts a 98% participation rate which has been attributed to a highly publicized educational program (Shrybman, 1989) and a weekly collection program (ILSR, 1991). The Region of Halton, has achieved an over 90% participation rate and also has a MSS program; however, according to Art Mercer (Region of Halton), participation rates exceeded 85% prior to the MSS legislation which were attributed to high level of community support and involvement (Mercer, 1992).

Rhode Island's IC&I MSS program

A mandatory source separation program for IC&I recyclables was added to Rhode Island's program in 1988. As of 1992, a total of 15 materials and material groups were designated for mandatory source separation by the IC&I sector. All businesses with more than 50 employees are required to reduce waste sent to disposal through recycling as well as to prepare recycling implementation plans and annual progress reports on waste diversion. The State of Rhode Island estimates that the regulations affect approximately 2,500 companies of 25,000 (Brown's University, 1992).

In 1992, Brown's University (1992) conducted a study for Rhode Island's Department of Environmental Management to evaluate the effect of the mandatory commercial recycling program on targeted companies. The survey respondents (448 companies) reported an average 34% diversion rate for source separated recyclable materials.

Collection Frequency

In general, municipalities are struggling to find effective approaches to reduce the costs associated with garbage and recycling collection. Over the past several years, municipalities have introduced a range of cost-cutting measures such as reduced collection frequency for garbage and recyclables. Some municipalities which have offered twice-weekly garbage collection, such as the City of Toronto, have reduced garbage service to once-a-week collection. Also, some municipalities have switched to bi-weekly collection of recyclable materials.

In the case of the City of Toronto, it has been argued that a two-person crew picks up an average of nine tonnes of garbage daily (during a twice weekly collection schedule) which is less than any other metro-area municipality (i.e., the City cites the example of New York City which achieves 16 tonnes per day per two-person crew) (Recycling Canada, July 1993). Reducing garbage collection is

anticipated to increase the amount of waste collected per hour and thus reduce collection costs (Pferdehirt, et al., January 1993). In addition, a reduced collection schedule may increase source reduction, backyard composting, and recycling activities.

Collection schedules for recyclable materials appear to affect the rate of participation and rate of recovery for the materials. After the City of Fairlawn, New Jersey switched from bi-weekly collection to weekly collection of recyclable materials, the volume of recyclables collected increased by 30% (Pferdehirt, et al. March 1993). In a study prepared by the Institute for Local Self-Reliance (1991), it was observed that an average participation rate of 91% was achieved for curbside collection programs based on a weekly collection schedule, compared with an average participation rate of 81% for curbside collection programs with bi-weekly (or less frequent) collection schedules.

Collection frequency may be related to the level of convenience and the amount of behavioural change being demanded of the residents which is considered an important factor in a recycling program's success (Deshaye, April 1990 and Bonini, February 1993). In addition, educational materials and literature affect the rate of participation (Pferdehirt, et al., March 1993).

Leaf and Yard Waste Landfill and Collection Bans

Leaf and yard waste comprises approximately 16% of the residential waste stream (G&S, 1991; W.R. Beck, 1992; G&S, 1992). Other communities, such as Quinte and Guelph, report that leaf and yard waste represents 34% and 22% of the residential waste stream, respectively (Quinte, 1992; Guelph, 1990). Materials include: leaves, grass, weeds, plant cuttings, twigs, hedge trimmings, and branches (sizes may vary among the Regions). In order to maximize the life span of landfills and minimize the costs associated with waste management, communities have begun to address the collection and disposal of leaf and yard wastes. In addition, municipalities recognize the effectiveness in helping to achieve diversion targets of diverting leaf and yard waste from disposal.

In Ontario, the responsibility for establishing material bans at landfills or transfer stations has been placed on regional municipalities In the United States, however, material bans are invoked at the state level. As of January 1994, twenty-four US. states will have enacted yard waste bans and/or source separation legislation (Monk, Sept/Oct 1992). In Ontario, an estimated 30 municipalities have initiated landfill bans and/or collection bans of organic materials (Virangu, AMRC).

Often the leaf and yard waste ban is coupled with a backyard composting program, centralized collection and windrow composting program, educational

program, and/or mulching program. For example, GTA municipalities have established aggressive backyard, educational and promotional programs, and operate at least 10 leaf and yard waste centralized composting sites (MOE, 1993). In addition, some municipalities have begun to explore the idea of banning the collection of grass clippings at the source of generation.

Increasingly, many municipalities responsible for the cost of collecting the leaf and yard wastes are looking at cost-effective alternatives to collection and disposal/processing of these materials. For example, the City of Oakville estimates that it costs approximately $500,000 annually to collect grass clippings. In an effort to eliminate this operating cost, and also increase waste diversion the City of Oakville passed a bylaw in June 1992 to ban the collection of grass clippings effective April 1, 1993. Grass clippings cannot be processed at Halton's composting facility due to restrictions imposed by the operating Certificate of Approval. Furthermore, the use of pesticides and herbicides on the grass may contaminate the compost product (Jones, City of Oakville).

Other Ontario municipalities, such as Kingston, Waterloo, and Ottawa, have invoked similar bans on the collection of grass clippings. Unlike these communities, however, the City of Oakville has decided not to provide grass collection depots for use by residents. This approach places the onus on the homeowner to deal directly with their yard waste. City staff hope this action will motivate homeowners to begin backyard composting, to mulch the grass and leave it on the lawn, or to switch to alternative landscaping techniques, such as xeriscaping (Jones, City of Oakville).

Xeriscaping

Xeriscaping is a method of landscaping/gardening which maximizes the use of perennial, and preferably native, plants in order to reduce or eliminate the use of pesticides/herbicides, maximize water conservation and minimize maintenance, such as mowing (MOE brochure, 1993). Increasingly, communities have begun to promote xeriscaping activities at the residential level as well as the institutional level.

The Evergreen Foundation reports that in North America an estimated 40 million lawnmowers consume 200 million gallons of gasoline annually and that lawn owners use up to one-sixth of all commercial fertilizers sold annually (Vaughan, August 1992). Furthermore, it is estimated that up to 75% of the costs associated with lawn maintenance could be saved by switching to more ecologically sensible landscapes (Vaughan, August 1992).

In the traditional sense of the term, xeriscaping involves the development of perennial gardens to replace traditional lawn landscapes. However, other

environmentally beneficial landscaping/gardening activities include rooftop/backyard gardening, alternative landscaping in municipal parks/parkettes, and development of community gardens (Hough, 1984).

Communities have begun promoting xeriscaping and alternative landscaping activities. The City of Oakville has a ban on the collection of grass clippings and offers no alternative disposal method for residents. The ban should increase the number of residents transforming their lawns to alternative landscapes (Jones, City of Oakville). In the summer of 1993, the municipality of North York eliminated the use of pesticides and herbicides on parks and municipal property (with the exception of soccer fields and other playing fields) in an attempt to move towards a more natural landscape. Elsewhere, in Metropolitan Toronto, experiments are being conducted to transform parks (or areas in parks) and other municipal grounds to natural, low maintenance/self-sustaining landscapes.

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SCHEDULE H

MARKETS

SCHEDULE H
Markets

H.1 GENERAL

Identifying markets for secondary materials is the key to developing and sustaining successful waste diversion programs that incorporate Reuse and Recycling.

This section addresses current and future markets for materials which may be recovered through GTA waste diversion programs. This section is organized by the following materials:

- — old newspaper
- — old corrugated cardboard
- — boxboard
- — old magazines
- — fine paper
- — mixed paper and other fibres

H.2 MARKETS FOR FIBRES

H.2.1 DYNAMICS OF WASTE PAPER MARKETS

Historically, secondary fibre has been recycled to some extent within the pulp and paper industry. Most of these fibres came from pre-consumer sources including paper mills (i.e., trail runs, off-spec product, cold rolls, floor scraps). Post-consumer sources have traditionally been restricted to the printing industry, (i.e., cuttings and overruns) and the retailing sector (i.e., old corrugated cardboard). This 'scrap' material was readily used by the pulp and paper mills since the majority could be added to the existing pulping process with little/no modification and it provided a low cost source of fibre for products, such as boxboard, which do not require superior qualities of primary fibres in production. In the past, other important markets for secondary fibre have included building products, such as fiberboard and roofing materials.

Other sources of post-consumer paper fibre, such as packaging and printed materials, were more difficult to recycle through the basic pulping processes due to the addition of inks, glues, and other materials. The advent of de-inking mills and equipment/process modification within existing mills has created an opportunity to incorporate post-consumer paper fibres generated by the residential and the IC&I sector.

The development of curbside residential programs has added a whole new dimension to the market for secondary fibres. These programs represent a

large source of fibre which, in some cases (i.e., old newspapers and old magazines), has offset the use of primary fibre in some applications.

In the short term, the secondary fibre market in North America is experiencing a glut of paper fibres as a result of several concurrent events. The rapid implementation of curbside programs has produced a glut of ONP throughout Canada and the United States. Landfill bans prohibiting the disposal of OCC and/or fine paper has also added to the glut of other paper fibres in the market. The recent introduction of mandatory source separation programs in several North American jurisdictions is also expected to contribute to the supply of secondary fibres.

North American mills producing newsprint, printing and writing paper, have responded to these forces with the installation of significant de-inking capacity to utilize secondary fibres. Over the long-term, the existing glut of secondary fibre in the North American market is anticipated to fall short of market demand. The Ontario market has proven fairly stable since Ontario-based mills generate ample demand for all secondary fibres collected through Ontario recycling programs.

However, the pressure is on some Ontario mills to find sources of cheaper secondary fibres. For example, boxboard, which in the past used about 45% of recovered ONP, is having to decrease its use of this fibre as demand for ONP and OMG by de-inking mills escalates and prices fluctuate (Slack, Sonoco). Subsequently, other cheaper fibres are being substituted. This trend has led to an unstable situation for some recycling companies and brokers resulting in price fluctuations for substitute feedstock material, such as OCC, mixed paper, and ONP.

Over the years, exports of secondary fibre from North America has played a major role in the fibre market. Countries such as Korea, Taiwan, and Mexico which are fibre-short, value the high quality of North American recovered papers, since they contain predominantly high quality primary fibres and produce a good paper through re-pulping. As a result of this demand, there is an extensive network of paper brokers who market fibres throughout North America as well as to export markets. However, as the North American paper mills continue to expand productions incorporating secondary fibres, greater pressure is being placed on brokers to maintain a secure and growing supply of secondary fibres to the North American market, at the expense of the export market.

In short, the marketplace is dynamic. Changes in prices, supply and demand will continue to affect the overall market and the individual markets for specific types of secondary fibres. The assessment of markets presented here identifies current markets used by Ontario sources of post-consumer

secondary fibres. However, it should be recognized that as new capacity to use recovered fibre increases, and as programs increase their recovery of these materials, markets will continue to change. Prices for most paper grades are expected to increase over time with an increase in demand resulting from new mills and greater de-inking capacity.

H.2.2 MARKETS FOR OLD NEWSPAPERS (ONP)

Canada remains a world leading exporter of newsprint (8,976,000 tonnes in 1991), with an average 87% (approximately 7,725,000 tonnes) exported in 1991 of which 64% (5,746,000 tonnes) was shipped to the United States. Domestic consumption accounted for only 14% of the total production (1,251,000 tonnes in 1991) by Canadian newsprint mills (CPPA, 1991)

In Ontario, the export situation is further exaggerated with the vast majority of newsprint (85-90%) manufactured by Ontario newsprint mills exported to the United States (Johnston, QUNO). The demand for recycled content in newsprint that currently drives the newsprint market in the United States has changed Ontario newsprint mills from small consumers of ONP, prior to 1991, to major importers in 1992. This trend will continue in the future as Ontario mills look well beyond the Ontario market for sources of ONP.

The Canadian newsprint industry remains relatively sensitive to changes in demand for newsprint and other factors affecting the quality of the finished products, such as the recycled content of newsprint. Over the past decade, ONP has become one of the most highly recycled post-consumer fibres in Canada with an estimated 40% of available ONP collected in 1991 through a variety of recycling programs operating in Canada; (CDNA, 1992) more than 50% of available supply was recovered in Ontario. With new recycling programs targeted at the residential sector and the IC&I sector over the next few years, it is anticipated that the majority of available ONP will be captured in Canada.

Definition
Old newspapers are primarily generated by the residential sector and the printing/publishing sector in the form of over issues. Grades of ONP vary according to the level of contamination and are defined by the Institute of Scrap Recycling Industries as # 6 News (typically collected in the residential curbside/depot collection programs); #7 Special News; #8 Special News De-Ink Quality (cannot contain any prohibitive materials such as magazines, glossy inserts, staples, etc.) (ISRI, 1991)

Historical ONP Market Overview
Historically, ONP has been collected from publishers' pressrooms (referred to as over issue news) and from newsstands in the form of unsold copies. Typical end uses for ONP by mills included the manufacturing of

containerboard, boxboard, and use in molded pulp mills. The use of ONP in the production of newsprint was not encouraged since only Grade #8 ONP (containing very low levels of contaminants) could be used by mills. At this time, newsprint mills could accommodate only minute levels of contamination (i.e., magazines, glossy inserts, staples, flyers). Other paper production processes, such as boxboard, molded pulp products, and construction board could handle lower grades of newsprint with a higher level of contaminants.

Between the years 1982 until 1991, only one de-inking mill (owned and operated by QUNO, formally Quebec and Ontario Paper Co.) operated in Ontario with a capacity to handle 158,000 tonnes of ONP. This situation changed as a result of several factors. The recent introduction of U.S. legislation requiring increased recycled content in newspapers has had a profound effect on the demand for ONP by newsprint mills located in Canada and, to a lesser extent, the United States. In addition, the City of Toronto recently imposed a requirement on Toronto newspaper publishers to incorporate 15% recycled content by June 1, 1993; 20% by June 1, 1994; 30% by June 1, 1995; and 40% by June 1, 2000. Consequently, over the past several years the Canadian newsprint industry has made significant investments of an estimated $1.2 billion to develop de-inking technology (CDNA, 1992).

Decisions made in the late 1980s have resulted in large increases in capacity to use post-consumer ONP in mills in both Ontario and Quebec, as well as in many U.S. states.

Current ONP Market Overview
The rapid progress in bringing Canadian de-inking mills on-line has resulted in a corresponding increased demand for ONP as a feedstock in the production of newsprint. The demand for ONP by Canadian mills has significantly increased since 1991 (when demand was 0.5 million tonnes). In 1992, demand for ONP increased to 1.2 million tonnes, and in 1993, demand is expected to increase to 1.3 million tonnes. Canadian residential curbside recycling programs recovered approximately 583,200 tonnes of ONP in 1992, leaving Canadian mills short of demand by more than half. With new recycling programs targeting both the residential and IC&I sectors over the next few years, an overall recovery rate of about 60% is considered feasible by the Canadian Daily Newspaper Association (CDNA) (CDNA, June 1992).

Since 1991, five mills have developed operations to permit the use of ONP in newsprint production, as shown in Table H-1.

Table H-1
Ontario Newsprint Mills with Recycled ONP Capacity

Company	1993 Estimated Annual Newsprint Capacity (000's tonnes)	Recycled Content	1993 Estimated Demand for Recyclable Paper (000's tonnes)
QUNO (Thorold)	340	70%	275
Atlantic Packaging (Whitby)	135	100%	160
Spruce Falls (Kapuskasing)	245	10%	30
Abitibi Price (Iroquois Falls)	–	15-20%	43
Abitibi Price (Fort William)	–	15-20%	18
CPFP* (Thunder Bay)	450	20%	120
		Total Demand	**646**

*CPFP-Canadian Pacific Forest Products

Sources: CPPA, 1993

Note: CPFP in Gatineau, Quebec is also a significant user of Ontario ONP.

These mills, with the exception of Spruce Falls, also accept old magazines at an average ratio of 7:3 (ONP:OMG). Taking the ONP:OMG ratio into account the Ontario-based newsprint mills demand for ONP (approximately 452,000 tonnes in 1993) outstrips current collection from Blue Box programs (1992) of 225,000 tonnes (Boland, OMMRI). The Ontario mills have had to look beyond Ontario borders, particularly to the Northeastern United States for additional supply of ONP (OPPUG, 1992).

Additional end users include mills producing paperboard (i.e. boxboard linerboard) construction board and material, molded pulp products (i.e. egg cartons, and plant bedding pots), tissue products.

ONP Prices

ONP prices remained stable around $40-50/tonne during the mid 1980s. From 1988-1990, prices dropped to $0-$30/tonne (OPPUG, 1992). By 1990, the QUNO paper strike forced recycling programs to find alternate markets. The majority of these markets were found overseas, and during this time many brokers received nominal revenue for the material.

More recently, prices have increased as a result of increased demand from the new de-inking plants. The 1992, Ontario market price for ONP ranged from $10 to $35 per tonne. Some forecasts suggest an increase in the ONP price to a level of $50 to $60 per tonne by the end of 1993. Prices are expected to stay at the $60/tonne level until the mid to late 1990's (Johnston, 1992). Current markets are beginning to show some strengthening of prices.

Diversion Trends

Ontario newspaper publishers have made efforts to reduce their consumption of newsprint through light weighting, and other activities. Since 1989, total newsprint consumption in Ontario has declined by 31%, as a result of smaller newspaper sizes, a shift to lighter weight newsprint, reduced advertising and reduced readership (OPPUG, 1992). An estimated 10% reduction in consumption by the Toronto dailies occurred between 1990 to 1991. In addition, the move to a new press plant by the Toronto Star and a smaller newspaper format is expected to significantly reduce newsprint use by the largest daily newspaper in the GTA. Toronto papers are also beginning to purchase newsprint with recycled content, partly resulting from a City of Toronto bylaw requiring recycled content in newspapers sold.

Future Market Trends For ONP

The newsprint industry is anticipated to remain the major market for ONP in the future, with modest increases in the use of ONP for other paper and non-paper applications.

Domestic markets have sufficient capacity to absorb all available ONP collected in Ontario. However, it is anticipated that Ontario mills will face a shortage of ONP supply as the demand for recycled content in newsprint continues to drive the newspaper industry in the United States (Johnston, QUNO).

Alternative end markets, which include construction board and material, molded pulp products, tissue products, cat litter and industrial absorbents, packaging and use of shredded ONP as animal bedding can also be considered for ONP. Recently, several new uses for ONP have emerged; for example, Impact Packaging of Swift Current, Saskatchewan is producing molded pulp meat trays using ONP. Trays are coated with a "special formula" to meet food packaging standards (Resource Recycling, August 1992). Also, East Providence

of Rhode Island has begun to experiment with using ONP as a component in the making of a gypsum fiberboard called Gypsonite. Gypsonite is a homogeneous mixture of gypsum and cellulose fibres; ONP provides the source of the cellulose fibre. (World Waste, Sept. 1990)

For the past 10 years, a German company has been transforming newspapers and magazines into 100% recycled copier paper. Recently the technology was introduced into the United States with the unveiling of the technology in Pennys Ivannia mill, owned and operated by International paper. (Resource Recycling, July 1993)

Market Outlook for GTA Generated ONP
Based on the above discussion, it is anticipated that markets for GTA collected ONP will be stable for the foreseeable future.

H.2.3 MARKETS FOR OLD CORRUGATED CARDBOARD (OCC)

Introduction
Old corrugated cardboard has one of the highest product recovery rates (primarily through the IC&I sector) (Apotheker, March 1993). Part of the reason for the high recovery rate of OCC is its concentration in large amounts from readily accessible sources. A recent US study by Andover International Associates (AIA, 1993) indicated that 50% of OCC is found in retail and commercial establishments (with an additional 28% in the manufacturing sector, 13% residential, and 8% pre-consumer off cuts). Further research indicates that 70% of OCC captured from the retail/commercial sector comes from large generators. For example, one case study showed that five large retailers in the United States alone recover nearly 1 million tons (1.1 million tonnes) of OCC annually (Watson, March 1993).

Definition
The OCC grade of waste paper primarily consists of used corrugated boxes. According to the Institute of Scrap Recycling Industries, OCC Grade #11 may consist of baled corrugated containers having liners of either test liner, jute or kraft. Prohibited materials may not exceed 1% and total outthrows may not exceed 5%. Pre-consumer double-lined kraft corrugated cuttings (DLK) is a separate grade of OCC (Grade #13) but this grade is often included in OCC recovery estimates (averaging up to 8% of total containerboard production in the United States) (ISRI, 1991).

Historical OCC Market Overview
OCC generated by the IC&I sector has been recycled by established markets for many years. Large grocery distributors, such as A&P and Loblaws, have been collecting and baling OCC for the past 20 years.

OCC is high quality fibre and traditionally has been recycled into boxboard and containerboard, including linerboard (the outer face of new corrugated boxes), corrugated medium (center fluting of a corrugated box) and chipboard (the filler materials for solid fibre board). Despite the recent interest by the fibre market to increase the amount of secondary fibres in the fibre feedstock at the mills, the containerboard and boxboard industry has used post- and pre-consumer materials for the past couple of decades. Relatively clean (without wax or coatings) OCC can be directly introduced in the pulping process for containerboard and boxboard production with no prior processing or de-inking.

The majority of containerboard mills have been situated in the eastern region of Canada, particularly Ontario, Quebec, and New Brunswick. This trend is expected to continue. Consumption of OCC by Canadian mills has increased over the years from 327,000 tonnes in 1975 to 948,000 tonnes in 1991 (CPPA, 1991). In 1988, approximately 70% of OCC consumption in Canada was used in the production of containerboard; the remaining 30% of OCC was used in the production of boxboard (MOE, 1993).

Current OCC Market Overview

OCC is one of the easiest materials to recover since it is easily obtainable in a clean, dry form from the IC&I sector. The Paper and Paperboard Packaging Environmental Council (PPEC) estimates that the IC&I sector generates 80% of the available corrugated container material (PPEC, 1992). Municipalities have begun to capitalize on the high visibility of OCC in the IC&I waste stream by enacting OCC bans at local landfills. This initiative has helped to achieve high recovery rates for OCC in excess of 50% for many jurisdictions. According to NAPP, (1992) the recycling rate achieved for OCC by Ontarios IC&I sector exceeded 60%.

For the past several years, the main users of OCC in Ontario have been those mills producing containerboard products including linerboard, corrugated medium, chipboard, and to a lesser extent, paperboard, which consume over 90% of recovered OCC. Table H-2 identifies the prevalent containerboard mills in Ontario and their consumption of OCC in 1992. The Sonoco and Domtar owned mills produce 100% recycled content containerboard products.

Table H-2
Ontario Mills Producing Recycled Content Containerboard

Mill	Location	OCC Demand (tonnes)
Sonoco	Brantford	30,000
Sonoco	Trenton	48,000
Atlantic Packaging	Scarborough	96,000
Domtar	Mississauga	68,000
Domtar	Trenton	68,000

(References: Maryanne Christie, Sonoco, Jeff Remouche, Domtar and Bob Nelson, Atlantic Packaging, February to March, 1993).

Three new major expansions of capacity will add to the Ontario market for OCC. These include:

Company	Location	OCC Demand (tonnes)
Domtar (1994)	Cornwall, Ont	120,000
Domtar (1996)	Windsor, PQ	240,000
MacMillan Bloedel (1995)	Sturgeon Falls, Ont	104,000
Projected future annual OCC Capacity		**464,000**

Other end uses of OCC include the manufacturing of kraft paper; tubes and core board used by manufacturers of tissue, toweling, giftwrap, textiles, etc.; gypsum wallboard liner and roofing felt used in home renovation and building; packaging materials used for the shipping and sale of breakable objects such as fluorescent light bulbs, china, etc. and heavy objects; and flowerpots and biodegradable gardening supplies used by greenhouses and garden supply outlets.

OCC is an international commodity which is strongly affected by national and international trends and developments, such as new market development, mandatory source separation programs, landfill bans, and recycled content legislation. For example, legislation introduced in France and Germany to make recycling programs available for the recovery of all packaging materials, including OCC, has had a profound impact on the export market. To cite one example, in Europe the price for OCC has fallen to historically low levels over the past three years due to the tremendous growth in available material (Fibre Market News, 1993).

OCC Market Prices

OCC prices have on average, been on the decline since the late 1980s. In the mid to late 1980s the price for OCC paid by Ontario mills ranged between $60 to $80 per tonne. Since then the prices have plummeted to lows of $15 tonne and averaging $25 to $35 per tonne (Remouche, Domtar).

The industry projects a modest increase in the price of OCC in the mid 1990s with a corresponding increase in demand (Apotheker, April 1992, March 1993). However, some volatility in prices is expected over the short period due to the low prices for other substitute fibres, such as ONP and mixed paper. The export market for OCC is expected to remain depressed due to the oversupply situation in Europe. These factors may create short-term fluctuations in the price until the market begins to stabilize (Resource Recycling, April 1993).

Diversion Trends

The Railways Association of Canada approved package weight reductions of 5% to 10% for shipping purposes. This is projected to result in reductions of up to 100,000 tonnes annually in the amount of OCC used for transportation purposes in Canada (Recycling Canada, August 1992).

Cardboard container reuse systems are being implemented by large and small companies. Xerox Corporation is an example of a company that has implemented a cardboard box reuse system. The company requires that its suppliers use any one of eight standard sized boxes to ship components. When shipments are received, a local distributor sorts and resells the boxes to Xerox suppliers.

Future Market Trends For OCC

Domtar has developed a new process to manufacture fine paper (a high value-added product) from OCC. This new technology should be in place by 1994 in Domtar's Cornwall plant, with a second plant in Windsor, Quebec coming on line by 1996. Domtar plans to license the patented technology world wide. Rather than de-inking recycled pulp, OCC will be used directly in the production of fine paper. OCC has virtually no inked surfaces, and avoids the need to de-ink other types of recycled pulp. Using OCC to make fine paper, such as copy or printing paper, is deemed a world first. Domtar plans to invest $200-million in the technology (McKanna, February 1993).

Waxed, coated, wet or organically stained OCC is not readily recycled by most mills. Waxed corrugated is generated in large volumes from a small set of users in fruit, vegetable and meat processing businesses. Several projects have been initiated to deal with waxed corrugated cardboard. One commercial compost site in Ontario has a Certificate of Approval to compost waxed corrugate. Results of waxed OCC composting trials sponsored by PPEC have proven successful. In addition, efforts are under way to develop

technology to remove the wax coating from the OCC for use in the production of new containerboard. In addition, research is underway in Scandinavia to develop a viable repulping process for waxed boxes (Apotheker, March 1993).

OCC has an established market in Ontario which is capable of absorbing more domestic OCC than is currently collected, but would have to compete with imported supply which has an established customer base. However, OCC demand is projected to increase significantly in the US southeast (Florida, Kentucky, Georgia) and depending on transportation costs and prices, may capture some of the US OCC now being shipped into Canada.

Market Outlook For GTA Collected OCC
The recovery rates for OCC across North America have increased due to increasing disposal fees, and landfill material bans (Apotheker, March, 1992).

Since OCC collection has become well-established in much of the IC&I sector, the opportunities to increase recovery lie in improving capture rates in the residential sector and penetration of the large number of smaller IC&I generators who do not currently recycle.

With significant increases in demand for OCC from mills in Ontario and Quebec, there is adequate market capacity to absorb OCC collected within the GTA. Composting of waxed corrugated has proven successful at the research level and it is expected that this may provide an outlet for some of the waxed OCC generated.

H.2.4 MARKETS FOR BOXBOARD

Introduction
In 1991, Canadian mills produced 826,000 tonnes of boxboard for Canadian and international consumption, based on data provided by the Canadian Pulp and Paper Association. Based on shipment data, PPEC estimates that 256,000 tonnes of boxboard were consumed in Ontario in 1992; the majority, (about 175,000 tonnes) in the residential sector.

The production of boxboard traditionally has included secondary fibres including ONP, OCC, and mixed paper. Only recently has post-consumer boxboard been introduced as feedstock material.

Definition
Boxboard is a general term conveying a range of paperboard products including folding cartons, setup boxes, and foodboard.

Historical Boxboard Market Overview

Traditionally, boxboard has been made with recycled fibre including ONP, OCC, and mixed paper, but post-consumer boxboard itself has not been used as a source of fibre due to the high level of contamination by materials including glues, plastics, and liners. Virgin pulp is often added to the mixture to provide additional strength and integrity to the product. The composition of boxboard varies considerably, depending on the price for the secondary feedstock and the availability. Consequently, there is no common "recipe" for boxboard production but according to Franklin and Associates (1991), the composition for boxboard in 1990 consisted of the following materials:

mixed papers	22%
newspapers	20%
corrugated cardboard	45%
pulp substitutes	10%
deinking	2%.

Current Markets for Post-Consumer Boxboard

In the past, contaminants such as hot melt glues, adhesives, wax coatings, plastic liners, plastic handles and tear tapes have prohibited the use of post-consumer boxboard as a secondary feedstock by mills manufacturing boxboard. Mills have used post-consumer materials considered of a higher quality. The introduction of front-end, cleaning equipment has permitted existing boxboard mills to remove glues, coatings and other contaminants found in bales of post-consumer boxboard. In addition, PPEC is currently working with package designers and adhesive manufacturers to reduce the use of materials which become contaminants in the recycling process.

Only two Ontario boxboard mills accept clean, baled, post-consumer boxboard. (Cascades Paperboard International in Toronto and Strathcona in Napanee). At Strathcona Paper, post-consumer boxboard collected through blue box programs is used to manufacture detergent cartons. These cartons currently contain up to 28% post-consumer boxboard with the remaining 72% consisting of other recycled fibre material (Recycling Canada, July 1991). Mills currently accepting post-consumer boxboard encourage municipal programs to limit collection to cereal and cracker boxes and pharmaceutical packages.

Another important source, other than the residential sector, of higher quality post-consumer boxboard is the IC&I sector, which also supplies the Strathcona Mill with secondary boxboard feedstock material. In 1992, the Strathcona facility substituted post-consumer boxboard (collected from the residential and IC&I sectors) for ONP at a rate of 21,000 tonnes, of which approximately half (12,000 tonnes) was supplied by the Ontario market with the remaining imported from Quebec and the United States (Hunter, Strathcona).

Table H-3 presents a summary of boxboard mills in the U.S., Ontario, Quebec and New Brunswick.

Table H-3
Boxboard Mills in Eastern Canada

Mill	Location
Sonoco (formerly Paperboard Industries)	Trenton, Ontario
Sonoco	Brantford, Ontario
Fraser	Edmonton, NB
Cascades	East Angus, Quebec
Daishowa Forest Products Ltd.	Quebec City, QE
Strathcona Paper	Napanee, Ontario
Cascades Paperboard International	Toronto, Ontario

Market Prices
In 1992, market prices for post-consumer boxboard were at $10 per tonne. More recently, the price has increased to $20 per tonne for boxboard collected through residential programs and $40 per tonne for boxboard collected from the IC&I sector (Hunter, Strathcona). The increase in price is attributed to improved quality of material and increased supply received by the mills.

Diversion Trends
Some companies have taken the initiative to use more post-consumer boxboard; for example, Proctor & Gamble and Lever Brothers are now specifying a minimum of 25% post consumer boxboard as filler stock in their detergent containers and chipboard. These and other efforts in market development will increase the demand for boxboard with recycled content (Quinte, April 1993).

Future Market Trends for Boxboard
The predominant use of boxboard is for food packaging. Post-consumer boxboard can be recycled into new board sheet which is converted into boxes for cereals, frozen foods, crackers, etc. This application is limited due to requirements that food contact packaging not contain post consumer recycled content. Two solutions to this dilemma are being pursued. First, at this time, PPEC has been in negotiation with health officials to review the requirements for food packaging to contain only virgin materials. PPEC has asked federal health officials to comment on the viability of increasing post-consumer materials in packaging. Second, a company in the United States (Westvaco Corp.) has developed a bleached board containing post-consumer fibres suitable for food-contact packaging that meets with U.S. Food and Drug Administration standards (TAPPI Journal, March 1993).

Ethanol production from boxboard is an alternative which has proven feasible at the research level. CanAgra is considering construction of a boxboard to ethanol plant to be located in the Bruce peninsula. It would require 170,000 tonnes of boxboard annually. The decision to proceed with the project depends on a number of factors, such as exemption of taxes for alternative fuels, use of residuals generated in the process for co-generation, etc. Should the project proceed, it could become the largest single consumer of old boxboard capable of absorbing about 65% of all post-consumer boxboard available in Ontario (Fenton, 1993).

A composting trial initiated by PPEC using boxboard as a feedstock met with disappointing results. High boron levels persisted throughout the tests. These were attributed to the type of boxboard packaging (i.e. soap/detergent packaging) used as feedstock as well as the glues (with high boran content) used to construct the containers (Recycling Canada, April 1992).

Kraft Foods has switched from using a hot-melt glue to a water soluble glue to adhere the boxboard containers. Water soluble glues can be more easily and effectively removed during the cleaning process.

Other markets being explored include animal bedding, building materials, roofing shingles, gypsum liner, construction paper, flower pots and insulation. If developed, alternative boxboard end uses such as these materials would be on a local or small scale.

Markets Outlook for GTA Collected Boxboard

The demand for post consumer boxboard traditionally has been relatively low in Ontario. If significant boxboard recycling efforts were to be initiated (e.g. if all GTA municipalities were to initiate expanded Blue Box programs), PPEC, supported by two Ontario mills, says that it can accommodate all boxboard collected through the Metropolitan Toronto and Mississauga curbside programs.

Some of the issues around the potential for successful increased recycling of boxboard (e.g. food contact packaging, use of different glues etc.) are not resolved at this time.

The potential to compost boxboard successfully, or use it for ethanol production are still being explored.

Therefore, markets for recycled boxboard are considered relatively undeveloped at this time. This will limit boxboard diversion unless significant market development efforts are maintained.

H.2.5 MARKETS FOR OLD MAGAZINES (OMG)

Introduction

OMG has recently found a niche in the paper market as a secondary feedstock material in the production of recycled content newsprint. Currently, most newsprint mills in Ontario accept OMG in the de-inking process at a ratio of 3:7 (OMG/ONP). OMG offers benefits associated with a higher quality fibre and the clay content which increases the de-inking efficiency (Waste Age, Jan. 1991).

Definition

Old magazines (OMG) has relatively recently been acknowledged as a separate grade of paper stock, having previously been considered part of the mixed paper grade. Magazines (Grade 10) consist of dry, baled coated magazines, catalogs, and similar printed materials and may contain a small percentage of uncoated news-type papers. Prohibited materials may not exceed 1 percent and total outthrows (not meeting the grade) may not exceed 3 percent. Common sources of OMG include residentially-generated and overissue magazines and catalogues (ISRI, 1991).

Historical OMG Market Overview

Prior to 1990, post-consumer magazine collection was virtually non-existent. Any recycling of OMG consisted of collection of post-industrial cuttings from printing plants. The traditional production process for newsprint did not permit the direct incorporation of old magazines due to the ink and glue contaminants. However, with the significant increase in de-inking capacity in North American newsprint mills, demand for OMG has soared, providing up to 30% of the fibre furnish used in the production of recycled content newsprint (Waste Age, January 1991).

Current OMG Market Overview

Newsprint mills remain the largest consumers of OMG, requiring OMG as a secondary feedstock in the production of recycled content newsprint. Technological developments in the de-inking process for old newsprint has resulted in the need for OMG as a feedstock due to its strong fibres and clay content. Clay coatings pose no problems in a modern de-inking mill and, in fact, are required for prime efficiency by adding stiffness, bulk and opacity to the newsprint. The clay stock in the OMG is used in the flotation de-inking system to stabilize air bubbles, generated as part of the cleaning process, which in turn facilitates separation of the ink from the ONP.

Table H-4 summarizes information on newsprint mills in Ontario accepting OMG.

Table H-4
Ontario Newsprint Mills Using OMG

Mill	Location	1993 Estimated OMG Consumption*
QUNO	Thorold	82,500
Atlantic Newsprint Company	Whitby	48,000
Spruce Falls	Kapuskasing	No OMG used
Abitibi Price	Iroquois Falls	12,900
Abitibi Price	Fort William	5,400
Canadian Pacific Forest Products	Thunder Bay	36,000
Total		**184,800**

* based on a 3:7 ratio of OMG to ONP in the production of newsprint .

Sources: CPPA 1993, RCO, 1992.

On average newsprint mills accept OMG at a 3:7 ratio to ONP. Some mills will accept OMG baled with ONP which reduces the sorting and processing requirements for operators of residential recycling programs. However, those relying on spot markets will have to separate OMG to meet most market specifications and receive good prices. Because many mills require OMG to be delivered separately from ONP, there has been some reluctance by program operators to expand existing residential recycling programs to include OMG. Market prices may play a greater role in determining whether a community chooses to collect OMG in the future.

Apart from the residential sector, magazine returns from stores and newsstands are an additional source of OMG. Together, these programs supply most of the OMG for use as secondary feedstock. A study recently conducted by a waste hauling company in the United States determined that the composition of OMG collected from residential curbside programs consisted of 41% magazines and 44% catalogues, with the remaining material consisting of pre-consumer magazines from stores and newsstands (Apotheker, February 1993).

Other major potential end uses of OMG include animal bedding, cellulose insulation, shingles, printing and writing paper, construction and wall board, recycled boxboard and tissue. Except for tissue products, these end uses provide a limited use on a local, small scale. OMG prices received are likely to be higher from newsprint mills which will likely deter the use of OMG for local, lower grade uses.

Market Prices

As a relatively new grade, there is a limited history with respect to price trends for OMG. Prior to 1990, collection and sale of post-consumer magazines as a separate grade was virtually non existent. The current market price of OMG is $25-$30 per tonne (Bexton, Metro Waste Paper). The price for mixed ONP/OMG is also approximately $25-$30 per tonne (Quinte, 1993).

Prices between $10-$30 per tonne are still not sufficient to attract many programs to the collection of OMG. A price between $25-$30 per tonne is considered a threshold price; prices above $30 per tonne should attract many more collection programs (Apotheker, February 1993).

Future Market Trends For OMG

New developments have permitted some mills (such as Manistique, Michigan) to use 100% OMG in the production of newsprint (Recycling Times).

With the anticipated strong demand for ONP in Ontario and the beneficial characteristics associated with OMG as a secondary feedstock in the production of newsprint, markets for OMG are expected to remain strong. New additions in recycled newsprint capacity in Ontario and Quebec are anticipated to increase overall demand for OMG by about 160,000 tonnes. The mills slated for future consumption of OMG are listed in Table H-5. Demand for OMG within Ontario, coupled with that of Quebec (where local collection is very small) will significantly outstrip supply from within Ontario.

Table H-5
Mills with Future OMG Capacity

Location		
Ontario		**OMG Requirements**
Boise Cascades	(1995)	32,000 tonnes
Quebec		
Donahue	(1995)	27,000
Daishowa	(1993)	30,000
Kruger	(1993)	18,000
Domtar	(1995+)	unknown
Cascades	(1993)	31,000
Stone	(1995)	22,000
	Total OMG capacity	**160,000 + tonnes**

Source: (Sarazin, Daishowa) (CAPPA, 1993) (RCO, 1992)

Market Outlook For GTA Generated OMG
Pre-consumer sources of OMG (newsstand returns and printing plant cuttings and over runs) are sources of high quality OMG. However, annual demand from Ontario newsprint mills for an estimate 185,000 tonnes of OMG will provide markets for a significant level of post-consumer OMG collection within the GTA.

In summary, markets for OMG which could be collected and diverted in GTA are considered strong for the foreseeable future.

H.2.6 MARKETS FOR FINE PAPER

Introduction
The rapid introduction of post-consumer fine paper in the manufacturing of printing and writing paper is a recent trend. Variations in the technology requirements have hindered the use of post-consumer fine paper in the past. In essence, the manufacturing process for printing and writing paper and tissue products requires more sophisticated cleaning procedures than those required in the manufacturing of containerboard and boxboard. The recent introduction of legislation and policies requiring recycled content in printing papers coupled with increased fine paper recycling programs in offices has spurred Canadian mills that manufacture printing and writing papers to install de-inking facilities. Since 1985, the number of Canadian printing and writing paper manufacturing companies using recovered fine paper has increased from one to sixteen (CPPA, 1993).

Definition
The term fine paper is often used interchangeably with high grade office paper and printing-writing paper. The definition of fine paper includes computer print out (CPO), white ledger and copy paper, and other papers that are groundwood free. (Typical groundwood paper products include magazines, newsprint, catalogs, and telephone directories). According to the Institute of Scrap Recycling Industries, fine paper consists of several grades of paper such as Grade #40- sorted white ledger, Grade #38 - sorted coloured ledger, and Grade #42- computer print out. This definition specifically excludes a sub-category of high papers known as pulp substitutes which are pre-consumer specialty paper grades collected from industrial scrap sources (ISRI, 1991).

Historical Fine Paper Market Overview
Prior to the 1990s, most printing and writing paper was made from virgin fibres. Only recently have mills introduced de-inking procedures. Prior to that, the vast majority of mills in North America operated without de-inking facilities; therefore, secondary fibres had to meet stringent specifications, including minimal ink, and no contaminants. Mills preferred the pre-consumer fine paper furnish because it contained long fibres and no ink. According to the Canadian Pulp and Paper Association (CPPA), in 1985 only

one Canadian mill used recovered paper as part of its fibre supply. In 1989, the number of Canadian mills using recovered paper had increased to two. Other typical uses for recovered fine paper was in the manufacturing of tissue products and containerboard.

The collection and incorporation of post-consumer fine paper from offices and other IC&I generators is a relatively recent phenomenon. In the past, most secondary fibres used in the production of printing and writing papers and tissue products have consisted of pre-consumer fibres from offcuts, trimmings, and floor scraps generated by print shops and paper manufacturers. Some computer printout and white ledger paper from offices and other post-consumer generators found its way to the mills but in relatively small portions. In 1987, the secondary fine paper furnish used by US mills consisted of 74% pre-consumer fibre and 26% post-consumer fibre, according to the United States Office of Technology Assistance (1989).

Current Fine Paper Market Overview

The 1990s have become a turning point for use of, and demand for, fine paper by North American mills. Several factors have contributed to the increased use of post-consumer fine paper, including the introduction of legislation and policies by government agencies and individual companies to use recycled content ledger paper, increased demand by consumers for recycled content paper and tissue products, and the introduction of legislation requiring source separation of designated materials, such as fine/mixed office paper, by the IC&I sector.

Paper mills have responded with the development of de-inking facilities in order to meet the increased availability of post-consumer fine paper coupled with an increased demand for recycled content paper products. The de-inking process removes inks, coatings, bindings, and other contaminants from the waste paper. The advent of the de-inking process has allowed paper mills to use a wider variety of fine paper grades including fine paper containing ink.

Since 1989, the number of Canadian mills manufacturing printing and writing paper that have begun to incorporate post-consumer fine paper into the manufacturing process has increased significantly. In 1992, 16 mills throughout Canada used recovered fine paper as feedstock. Eight mills located in Ontario accept fine paper/mixed paper. Table H-6 provides a list of Ontario mills producing recycled content paper.

Table H-6
Mills in Ontario Accepting Fine Paper Grades/or Mixed Paper*

Mill	Location	
Atlantic Packaging	Whitby	Tissue
Beaverwood Fibre	Thorold	Special Fibreboard
Sonoco (Paperboard Industries)	Toronto	Container Board
QUNO	Thorold	Pilot project to incorporate into newsprint
Nasada	Thorold	Fine Paper
Strathecona	Napanee	Boxboard
Domtar	Mississauga	Containerboard
Domtar	St. Catharines	Fine Paper

Source: Wood,CPPA
*Note: List is not entirely complete since not every CPPA member reports this information

The demand for recovered printing and writing papers has increased over the past several years. According to CPPA, domestic collection of recovered printing and writing paper from Canadian collection programs (mostly office paper programs) was estimated at 350,000 tonnes in 1991 and 380,000 tonnes in 1992 (CPPA, 1993).

Currently, Ontario mills are having to import recovered fine paper from the United States, which is experiencing a temporary glut of fine paper. All fine paper collected through office paper recycling programs in Ontario is being absorbed by the Ontario mills. Many offices in Southern Ontario are currently engaged in office paper recycling programs. Additional sources will be realized once residential curbside programs are expanded to include fine paper collection. According to one source, Ontario mills will have no problem incorporating the additional supply of fine paper into their productions (confidential source).

Other end uses for fine paper include the manufacturing of tissue products, containerboard, and the outer layer on boxboard. Considering the relatively high market price paid for ledger paper and computer printout paper compared with mixed paper and other groundwood papers (such as ONP, and OCC), most of these mills prefer to use the lower priced, lower grade secondary fibres over the high grade computer printout and white ledger secondary fibres.

Market Prices

In general, prices paid for fine paper varies dramatically depending on whether it is sold as mixed high grade (includes CPO, white ledger, and coloured ledger) or is sorted and sold as individual grades. For example, in late 1990, office mix traded at minus $10 per tonne in Toronto compared to $140 per tonne for CPO, and $110 to $145 per tonne for white and coloured ledger. In 1992, the price for CPO ranged from $190 to $220 per tonne and the price for white and coloured ledger ranged from $120 to $140 per tonne. On average, the fine paper grade collected between $100 to $120 per tonne (Hunter, Strathcona and Remouch, Domtar).

Prices for all sub grades of fine paper are expected to improve as capacity and demand increase over the next several years.

Diversion Trends

Although difficult to predict, efforts to reduce paper use through the introduction of electronic mail, reuse of paper, and double-sided printing and photocopying may result in a reduction in paper use and, correspondingly, the availability of post-consumer high grade paper from the IC&I sector.

The generation of fine paper by the residential sector may be affected as efforts to reduce the volume of junk mail increase. The trend among companies which distribute flyers and pamphlets is to switch from using fine paper to using newsprint. This activity may have some impact on the availability of post-consumer fine paper generated by the residential sector.

Future Market Trends For Fine Paper

In the past, contamination of high grade papers in office paper recycling programs has proven to be a problem for paper collectors. Contaminants, such as self-adhesive labels, window envelopes, thermal (facsimile) paper, and sticky notes devalue the office mix if they are mixed with high grade fine paper. Before, paper collectors tended to establish office paper recycling programs that required a high level of paper separation activity by employees and often led to poor product quality. The emerging trend among paper collectors is to establish mixed office paper recycling programs. The collected paper mix is then separated for its high grade papers at a processing facility.

The increased use of laser printers has posed a new problem for paper collectors and paper mills. Laser printed fine paper cannot be de-inked sufficiently using the conventional flotation de-inking process. Despite the high quality ledger paper used in laser printing, this paper is most often used in products that do not require de-inking, such as paperboard, containerboard, and molded pulp products. Recent innovations in the de-inking technology are enabling mills to use laser printed papers in their high grade feedstock. Other innovations are now permitting other post-consumer paper products (such as thermal (facsimile) paper, and window envelopes) to be included in recycling programs.

Other activities include:

- 3M has modified the glue used in their Post It notes to make them more recyclable. Their sticky notes are no longer considered a contaminant in recovered high grade paper (Chemical Marketing Reporter, Jan, 1992).

- Eastman Kodak is reportedly investigating the development of a mini mill at the site of its Rochester, New York research park office facility. Recovered paper from the 44,000 employee facility would be pulped, but not de-inked. Kodak is evaluating potential applications for the pulp.

- One company in Toronto, Inter City Papers, claims to be the first company in Canada to collect fine paper from its clients and then provide recycled content paper made from the recovered fine paper as part of a closed-loop recycling process (Recycling Canada, Feb, 1992).

In addition, demonstration projects have been conducted to determine the feasibility of interdicting post-consumer fine paper as feedstock in compost production and ethanol production (Biocycle, Dec, 1992).

Market Outlook For GTA Generated Fine Paper
Based on the above discussion, it is anticipated that markets will be available for fine paper recovered in GTA for the foreseeable future.

H.2.7 MARKETS FOR MIXED PAPER AND OTHER FIBRES

Introduction
Mixed waste paper grade is one of the more difficult grades to recycle because of the variability of paper grades within the mixture. Mixed grades vary in fibre length, contamination levels, and processing requirements. Consequently, it can be difficult to market when other more homogeneous

substitutes, such as ONP and OCC, are readily available at a reasonable price, which has been the case for the past several years.

There has been a change in the overall mixture of the mixed grade going to mills, as recycling companies and brokers remove the more valuable, high grade paper, such as computer printout paper and white ledger paper, from the stream. The end use market for mixed paper, however, has remained fairly consistent over time. The major end users include mills manufacturing tissue products, boxboard, containerboard, and to a lesser extent, roofing materials.

Definition

Mixed paper is a catch-all category, comprising of all grades of waste paper including groundwood stock (ONP, OMG, OCC) and fine paper (CPO, white ledger and coloured ledger). Definitions of mixed paper vary according to the required use. The Institute of Scrap Recycling Industries, however, classifies mixed paper into two grades:

- Grade #1 Mixed Paper - consists of a mixture of various qualities of paper not limited as to type of packing or fibre content. Prohibited materials may not exceed 2% and total outthrows may not exceed 10%;

- Grade #2 Super Mixed Paper – consists of a baled, clean sorted mixture of various qualities of papers containing less than 10% of ground wood stock, coated or uncoated. Prohibited materials may not exceed 0.5% and total outthrows may not exceed 3%.

Based on these definitions, mixed paper can be understood, for the purposes of this document, to include a wide variety of papers (including ONP, OCC, boxboard, packaging materials, envelopes, and magazines) all in a mixed form. Mixed paper, by definition, is unsorted; however, it is always possible that other higher grades of waste papers will be sorted and sold separately for considerably higher prices.

Historical Mixed Paper Market Overview

Mixed paper traditionally has been used by mills in processes that have higher tolerance for contamination and can accept heterogeneous feedstock mixes. Purchasers of mixed paper include mills manufacturing boxboard, containerboard, molded pulp products, and roofing products. The use of mixed paper has been influenced by price and availability. Due to the nature of the manufacturing process, mill producing containerboard, boxboard, and roofing products can effectively substitute mixed paper for ONP and OCC as prices vary. Consumption of mixed paper by Canadian mills has steadily increased from 50,000 tonnes in 1975 to 121,000 tonnes in 1988 (CPPA, 1991). However, the number of mills capable of using mixed paper is limited due to

the problems associated with high levels of unknown mixed grades and contamination levels (Wood, CPPA).

Current Mixed Paper Market Overview

Unlike the fine paper market, end uses for the mixed paper have not varied over the years. Boxboard industries are reported to have the potential to use 40-50% mixed paper as furnish (Ruston, Jan. 1992). Corrugated medium manufacturers are also able to absorb minor fractions (10-20%) of residential mixed paper grades, provided contamination levels are not too high. Products such as asphalt-coated roofing felt and the paperboard lining of gypsum wall board have also provided a major outlet for mixed paper. In Ontario, however, much of the mixed paper is consumed primarily by mills manufacturing tissue paper products, such as napkins, toilet paper, and tissue paper, and containerboard.

Since 1988, the reported consumption of mixed paper by mills has declined partly due to the low prices for ONP and OCC substitutes over the past several years, and partly due to increased activity by paper collectors to separate out the higher grade ledger paper and computer print-out paper. Mills generally prefer ONP because it is less contaminated and easier to manage in the manufacturing process. Despite the decline, over the past two years consumption by Canadian mills of mixed paper has remained relatively stable, averaging between 104,000 tonnes and 109,000 tonnes for the years 1990 and 1991, respectively (CPPA, 1991).

In addition, demand for mixed paper, like other paper markets, is affected by consumer demand for recycled content paper and packaging products. Customer demand for tissue products containing recycled content has steadily increased over the past several years which has affected the demand for mixed paper and its substitutes by those mills producing tissue products. The mixed paper market also has been affected by the strengthening of the organic roofing market.

Market Prices

The price paid for mixed paper is highly variable as the market for this commodity fluctuates with demand and the quality of the mixture required by individual mills. Prices have varied ranging from $0 to 30 per tonne, with some mills paying virtually nothing for highly irregular mixed blends (Wood, CPPA and Dunkley, Quinte).

In general, low prices for mixed paper can be expected to continue as long as inexpensive ONP and OCC grades are available. As prices for ONP and OCC rise, demand and prices for mixed waste paper should rise as well. Prices may increase as a result of increased demand for mixed paper resulting from new technological innovations that permit greater use of mixed paper as a secondary feedstock.

Diversion Trends

As with office paper, it is difficult to predict the effect of efforts to reduce paper use through the introduction of electronic mail, reuse of paper and packaging, supplier take-back programs for packaging, and double-sided printing and photocopying. Recycling will continue to increase marginally in the IC&I sector, with the major differences occurring in the type of materials permitted in the recycling stream. New technological innovations should result in the expansion of the types of mixed paper products permitted in the recycling stream (Recycling Times, Sept 1991).

Collection of mixed paper products will continue in the residential sector as well with continued expansion of the types of paper materials permitted in the recycling stream.

Future Market Trends For Mixed Paper

Several demonstration projects have commenced recently which incorporate mixed paper in innovative production processes. Demonstration projects have been conducted to determine the feasibility of introducing post-consumer paper as feedstock in compost production and ethanol production. For example, two separate composting projects have begun in Durham, North Carolina and Ulster County, New York which use mixed residential paper as a compost feedstock (Biocycle, Aug 1992 and Dec 1992). Elsewhere, in Norval, Ontario and Gainsville, Florida, concurrent experiments are being conducted to test the production of fuel alcohol using low grade paper products (Norval experiment) and paper mill sludges (Gainsville experiment) (Resource Recycling, Aug 1992 and Dec 1992).

In addition, Can Fibre Group Ltd in Oakville, Ontario recently announced the development of an innovative technology that manufactures a wood-like product using wood and paper waste. The fiberboard can be used in the production of furniture and windows (Resource Recycling, March 1993).

A new, emerging technology which may have a significant effect on the use and demand for lower grades of mixed paper is a steam explosion process patented by Recoupe Recycling of Montreal, Quebec. The technology uses steam to explode break the paper bonds of different grades of paper to produce a more homogenous fibre mixture (Recycling Times, May 1992).

In the short-term, the demand will remain low for mixed paper used by paper mills as long as the mixed paper is unsorted and contains irregular grades. Composting and ethenol projects provide a potential end use market for these irregular mixes of paper. However, mixed paper that is sorted into different grades of paper will continue to be used in the manufacturing of tissue products, boxboard and containerboard.

Markets for Telephone Directories (OTD)

Telephone directories are a sub-set of the mixed paper category, and are discussed separately because of a number of product-specific issues and initiatives. Significant gains have been made in the past few years in recycling of telephone directories. The fibre is high quality, but dyes, cover stock coatings and bindings presented problems for the mills. Bell Canada initiated major research efforts to increase the recyclability of their directories as well as funding research into alternative uses for old directories, and is continuing to increase the recycled content of its directory paper. Telephone directory companies have formed YPPEN, Yellow Pages Publishers Environmental Network to co-ordinate and share efforts to increase recyclability of directories and develop collection systems and markets for OTD.

Cascades in Quebec recycled the majority of OTD from Ontario residential recycling programs in 1992 (Rowden, Cascades). Offshore markets, particularly in the Pacific Rim, also accept telephone directories. Cascades recycled 5,550 tonnes of OTD from Ontario; an additional 250 tonnes was exported in 1992.

Telephone directories must be supplied to markets either strapped or in gaylords, and be free of any other fibre contaminants. Some paper mills recycling OTD have developed their systems to handle hot melt glue, while others prefer water soluble glues. Thus individual mills may have additional specific. Ontario phonebooks (Bell Canada) are now printed with vegetable based inks, and the bindings are made with water soluble glues (Bell, 1992).

Cascades recycles telephone directories into tissue products which contain a minimum of 33% content of yellow and white phonebooks. Examples of these products are the kitchen paper rolls currently sold by Loblaws and Canadian Tire as one of their line of "green" products (MOE, 1993).

Bell has supported research into the use of directories for animal bedding and in the production of fiberboard. Both of these uses depend on the availability of markets. Shredded telephone directories have been successfully used as animal bedding at the New Liskeard College of Agriculture.

Glue and binding changes and the elimination of plastic coatings have increased the recyclability of OTD, allowing access to a broader range of markets. These include end uses which recycle other fibres including boxboard, cellulose insulation, building materials and molded pulp products (Bell, 1992).

All GTA municipalities recover telephone directories, as do a number of IC&I establishments. Bell estimates directory recovery and recycling in the GTA at

approximately 50%. Recovery levels could improve due to increased capacity at Cascades and other markets. YPPEN members are looking at recycling OTD back into directory paper and are committed to achieving 10% recycled content by 1993, 25% by 1995 and 40% by 1998 in their directories. This level of recycled content will stimulate demand for OTD from the North American mills.

The current market price of telephone directories is between \$0-\$5 per tonne and export markets pay \$15 to \$25 per tonne.

Telephone directories have reduced paper usage through light weighting and are smaller to some extent due to the recession. Combined, these account for about a 15-20% reduction in total paper used for directories in Ontario over the past 2 years (Bell, 1992).

Research into the use of electronic directories is underway, but will require subscribers to have the necessary hardware and software. Most believe that they will not be introduced for about 5 years. Moreover, Bell is required by the CRTC to provide each subscriber with a directory.

Markets for Polycoat Packaging

Polycoat packaging is used in milk containers and drink boxes. Both Tetra Pak and Daishowa which produce these packages have supported pilot collection and recycling programs (in some jurisdictions outside of Ontario). Metro Toronto has committed to adding polycoat to their Blue Box program by October 1993, and the Quinte program in Eastern Ontario has been collecting polycoat for over a year. Polycoat is one of the materials which would be collected in Expanded Blue Box programs considered for the residential sector.

Currently there are no markets for post-consumer polycoat in the GTA. The polycoat collected in Quinte (milk containers and frozen food containers) is currently sold to Donco Paper in Ohio (Quinte, August, 1993). Four Ponderosa Fibres mills (California, Georgia, Tennessee, and Wisconsin) accept milk cartons (and drink boxes) for making market pulp used in writing paper, tissue, coated stock and copy paper. Also, James River, Wisconsin and Pope & Talbot, Pennsylvania, accept the material to be used in the production of tissue.

In general, most mills with a hydrapulper can accept polycoat. After hydrapulping, the pulp yield is 75% for milk cartons (40% for drink boxes) (Wastelines, February, 1991). The quality of the pulp is equivalent to computer printouts, only the fibres are stronger and longer. Table H-7 lists U.S. mills presently accepting post-consumer milk cartons.

Table H-7
U.S. Mills Currently Accepting Polycoat

Mill	Location	End Use
Donco Paper	Ohio	
Pope & Talbot	PA	tissue
James River	WI	tissue
Ponderosa	CA, GA, TN, WI	market pulp
Weyerhaeuser	WI	corrugated medium

Tetra Pak is interested in using the recycled pulp for their own product. However, issues of food safety must first be settled with the U.S. Food and Drug Administration (Harris, International Paper). The pulp from post-consumer milk cartons and drink boxes is used in the production of corrugated cardboard by Weyerhaeuser, in Washington state, for Tetra Pak. The pulp is used for a low value product and is not utilizing the post-consumer pulp to its full potential.

Quinte received approximately $90 (U.S.) per tonne of polycoat from Donco Paper in Ohio. Also, seven mills accepting post-consumer milk cartons (mixed with drink boxes) in the U.S. guaranteed long-term (ie. up to the end of 1993) prices of $120 and $150 per ton, however these prices have been artificially inflated in order to stimulate collection (Resource Recycling, August 1992).

There are limited prospects of markets for polycoat developing within southern Ontario in the short term. Even with high participation rates, GTA collected milk cartons could would not provide sufficient supply to justify a new hydrapulping mill (Harris, International Paper). GTA polycoat, if collected, is most likely to rely upon markets in the northeastern U.S., however, as supply increases, prices can be expected to decline.

Market Outlook for Mixed Paper and Other Fibres
From the above discussion, it is concluded that markets will exist for most mixed papers as long as they are sorted into different paper grades. Prices will vary depending on the material.

Markets for Plastics

Introduction
Recycling of post-consumer plastics has not yet been fully developed for the many resins, and combination resins that are presently used and disposed. In general, markets for single resin plastic materials are stronger than for

'composites'. Markets for HDPE and PET are better developed than they are for other materials (i.e., PP, PVC, PS).

One of the major barriers to increased recycling of post consumer plastics is the strength of end markets which are dependent on maintaining clean, stable sources of secondary feedstock. Plastics, unlike other recyclable materials, have an extremely low tolerance for contamination by other resin types and colours. Significant efforts have been and continue to be placed on developing technologies capable of identifying, segregating and washing plastics. Consequently, end-use markets demand clean, contaminant-free feedstock.

Definition

Plastics are a petroleum-based product consisting of a great variety of resins with differing properties. Plastic resins are either thermosetting or thermoplastic. Thermosetting plastics, such as tires and fibreglass, cure or harden as a result of a chemical reaction, and cannot be remelted after being set. On the other hand, thermoplastics can be remelted and shaped again which has made its use very attractive to the plastic packaging industry. The packaging industry primarily uses thermoplastics because they can be easily formed into a multitude of shapes (B.C. Environment, 1990). Table H-8 identifies typical plastic resins formed into thermoplastic packages. The Institute of Scrap Recycling Industries (ISRI, 1991) identifies different grades of post-consumer plastics for end-use purposes.

Table H-8
Plastic Resins Used In Packaging

Plastic Resin	Definition	Packaging Products
PET (Polyethylene Terapthalate)	P-100 -PET Mixed, bottles only P-101 -PET Clear, bottles only P-102- PET Green, bottles only P-103- PET Clear and Green P-104- PET Custom, bottles & jar P-105 - PET Mixed, containers	Soft drink bottles tubs trays peanut butter containers
HDPE (High Density Polyethylene)	P-200 - HDPE Mixed, bottles P-201- HDPE Natural, bottles P-202- Pigmented, bottles only	milk jugs water jugs liquid detergents
PVC (Polyvinyl Chloride)	P-300- PVC Mixed, bottles only P-301- PVC Natural, bottles P-302-PVC Pigmented, bottles	blister packs cooking oil bottles liquid detergent bottles
LDPE (Low Density Polyethylene)	P-400- LDPE Mixed, bottles only P-401-LDPE Mixed, bottles only P-402-LDPE Pigmented, bottles	lids squeeze bottles bread bags shopping bags
PP (Polypropylene)	P-500-PP Mixed, bottles only P-501-PP Natural, bottles only P-502-PP Pigmented, bottles	syrup bottles ketchup bottles yogurt containers margarine tubs
PS (Polystyrene)	P-600- PS Mixed, bottles only P-601- PS Natural, bottles only P-602- PS Pigmented, bottles	coffee cups meat trays packaging "peanuts"

Sources: (ISRI, 1991)
(B.C. Environment, 1990)

Traditional Plastics Market Overview

The advantages associated with plastics include light weight, durability, low cost, and ease of processing/converting. These advantages have led to a rapid increase in both the types of plastics resins available, and their use over the past couple of decades. According to the Society of Plastics Industry (SPI) domestic resin consumption in the U.S. rose 9.8% between 1991 and 1992 (Resource Recycling Plastics Recycling Update, January, 1993). Recycling, on the other hand, has not kept pace with the generation of plastic packaging.

Over the years, the packaging industry has used different plastic resins for similar end-use applications. For example, tubs may be manufactured from a variety of resin types, including LDPE, HDPE and PP (Quinte, 1993). Detergent

bottles may be manufactured from a variety of resins, including HDPE, PVC, and PP. Recycling companies most often have had to rely on hand sortation to separate the different resin types; however, poor or non-existent labelling make this difficult. Manual sortation relies on the ability of visually detect different resin properties; this is one of the major limitations associated with manual sorting.

For this reason, emphasis has been placed on resin identification and sorting equipment is beginning to be developed. Industry is currently engaged in developing technology to permit automatic identification and sorting of different resin types. However, the high capital costs coupled with the low prices for virgin resins have hindered the proliferation of a widespread plastic recycling industry. Consequently, end use market development has lagged behind the availability of post-consumer plastics.

In the past, several strategies have been developed to help facilitate plastic recycling. In the late 1980's, the Society of the Plastics Industry, Inc. (SPI) introduced a voluntary plastic coding system to help recyclers identify the types of plastic used in making individual bottles and containers. The system was introduced as a temporary solution to the sortation and identification problem facing recycling companies. The coding system has been successful to the extent that industry has adopted its use and voluntarily labelled its plastic products. As of May 1993, 38 states in the U.S. have passed legislation mandating the coding of plastic bottles and containers using the SPI coding system (Environmental Packaging, May, 1993).

Current Plastics Market Overview

For most resins, the market situation for post-consumer plastics has not changed significantly over the past years. The percentage of post-consumer plastics recycled compared with plastic sales for the years 1990 and 1991 shows marginal increases, but represents nominal achievements overall, as follows:

		% Plastic Sales Recycled	
		1990	**1991**
PET	– soft drink bottles	29.8	35.1
HDPE	– natural bottles	5.9	14.0
	– base cups	37.7	41.1
	– other packaging	0.1	0.6
PVC	– bottles	0.7	0.8
LDPE/LLDPE	– other packaging	1.2	1.0
PS	– all packaging	0.6	1.2

Source: (Modern Plastics, 1992)

The imbalance between capacity and demand spans North America.

The prime goal of plastics recycling is to provide a secondary feedstock material that is virtually identical to virgin feedstock. This requires not only separation by resin type, but also by colour. Currently, most activities to sort plastics still rely on labour-intensive, manual processing. Also contaminants such as other resins, and small mixtures of foil, dirt, and metal fragments limit the value of post-consumer plastics (Minnesota Office of Waste Management, 1992).

The advantage associated with the light weight of plastic packaging has proven to be a disadvantage to recyclers trying to transport the material to end markets. Some recyclers have begun to granulate or densify the plastic material at the processing facility prior to shipment to the end-use market in order to achieve increased density and reduced transportation costs. The recyclers must maintain very high quality control standards over the granulated/densified secondary feedstock to ensure low contamination levels. Once the plastic material is granulated or densified it is very difficult to detect contamination levels, therefore, some brokers are reluctant to accept granulated or densified shipments since it reduces their ability to monitor the quality of the material (Minnesota Office of Waste Management, 1992).

The current market situation for different plastic resins varies depending on the type of resin and the level of market development that has taken place over the years. For this reason, each resin type will be discussed separately.

PET:
Regulations 622/85 and 623/85 of the Ontario Environmental Protection Act requires that a recycling rate of 50% be achieved for PET soft drink bottles. Twinpac, which markets most of the PET used in soft drink containers in Ontario, has subsidized the collection and recycling of PET in Ontario for some time.

PET collected through residential and IC&I recycling programs is sold loose or baled. PVC contamination or PET bases contaminated with PVC can render the shipment unacceptable since PET and PVC are incompatible resins. The maximum allowable PVC contamination is 1% (Potelle, Twinpac).

All non-contaminated PET is currently sold to Twinpac which provides a subsidy and sells it to Wellman, Inc. in Johnsonville, South Carolina (for processing). Wellman has the capacity to process 90,000 tonnes of PET/yr. Twinpac pays $165/tonne for PET while the true market value is currently $40-88/tonne. The price paid by Twinpac has decreased from $400/tonne within the last two years. The reason for the price drop is that more PET is now entering the market from non-soft drink uses such a liquor bottles, etc., and Twinpac does not wish to subsidize collection of these sources.

PET is then sold in a pelletized form to end-users for manufacturing into a variety of products. PET end-uses include fiberfill, industrial strapping, textile substitutes, tennis ball containers, carpet fibre, etc. The depolymerization process used by Hoechst and Eastman now allows recycled post-consumer PET to be depolymerized and reblown into new bottles for use in food applications. Concerns with depolymerization technology for PET include: the high energy requirements, the need for very clean scrap, the high cost (50% more expensive than virgin plastic), and the lack of applicability to other resins (Powell, May 1992).

HDPE:
HDPE collected through GTA programs is primarily marketed through Dow and DuPont. It is incorporated into new bottles with recycled layers or recycled content. Some HDPE is used for garbage bag feedstock, sheet, injection molding applications, and overwrap film (e.g. packaging for paper towels). Primary end-markets include Lever, Colgate, Esso and Shell. For DuPont, recycling HDPE is not profitable as there is not enough market demand for recycled HDPE (Riddell, DuPont).

Dow markets HDPE primarily to Esso and Shell. Dow has had problems marketing the recycled HDPE and is warehousing material at present. It is in search of firmer markets to sell all of the material this year (Hyde, Dow). However, post-consumer HDPE rigid bottle specifications are changing; Procter & Gamble has set more rigorous standards for post-consumer content bottles, for example, some plastic bottles may contain at least 50% recycled content (Recycling Today, November, 1992).

DuPont pays between $50-130 tonne for HDPE collected in the GTA (Riddell, DuPont). The material is processed by Desbro in Scarborough and is then marketed by Dupont. Resource Plastics (Brantford) pays $72.50/tonne for HDPE (Horn, Resource Plastics).

Plastic Film:
Many large IC&I sector producers of pre and post-consumer film currently recycle their film through Resource Plastics. However, the majority of film is still landfilled (Horn, Resource Plastics). With an expanded film processing line, Resource Plastics will have the capacity to process 8,000 tonnes of plastic film per year, although odour problems are a current limitation to the process. Reliable Recycling accepts post-commercial film from 120 McDonald fast food restaurants in Ontario.

In the past post-consumer plastic film from industrial sources has found more markets than curbside plastic film. The film is used in shopping bags, garbage bags and in some cases, is included in mixed plastic lumber. Contamination (i.e. inks, other plastics and non-plastics) levels determine

whether this material is recycled back into a new film. A post-consumer content of 15% was successfully tested in the production of garbage bags, however, a reduction in non-plastic and other plastic impurities could double this percentage (Stanford, Climenhage and Bateman, May 1992).

Until recently, collection of post-consumer plastic film from the residential sector has been limited in scope. In May 1993, the Plastics Film Manufacturers Association of Canada (PFMAC) strengthened its commitment to plastic recycling by agreeing to provide markets for post-consumer plastic film collected from the curbside recycling programs of four municipalities (Hamilton/Wentworth, Mississauga, Peterborough, and Quinte). The post-consumer plastic film collected will include grocery sacks, shopping bags, milk pouches, bread bags, produce bag and overwraps for tissue products (Recycling Canada, April 1993; Green Packaging 2000, May 1993; Lauzon, May 1993).

Polystyrene (PS):
In Fall of 1991, the Canadian Polystyrene Recycling Association (CPRA) opened the first Canadian polystyrene recycling facility in Mississauga, Ontario. The CPRA facility has the capability to process both pre-consumer polystyrene generated by the IC&I sector as well as post-consumer polystyrene generated by the fast food industry and the residential sector (EPIC, May 1991). Currently, CPRA is not operating at full plant capacity. Polystyrene processed by CPRA is primarily converted into office products by Rubbermaid (e.g. in/out trays, scissors handles, etc.). Recycled polystyrene is also used in wall sheathing (Resource Recycling's Recycled Plastic Update, December 1992).

In 1993, two municipalities in Ontario (Quinte and Prince Edward County) are collecting and shipping post-consumer polystyrene generated by the residential sector to CPRA (OMMRI, 1993). The IC&I sector provides the greatest source of polystyrene to the CPRA facility with an estimated 48% supplied by the food services sector, 17% by hospitals, and 12% by educational institutions (Resource Recycling's Recycled Plastics Update, December 1992). Post-consumer polystyrene is pre-sorted and sent to the facility, however, initially no revenues are generated from the sale of the post-consumer material. Now Quinte receives 3 cents per pound, delivered (Quinte, 1993). Washing of the post-consumer material occurs in the facility.

PVC:
PVC is not collected from the residential sector in the GTA. It is sorted from mixed plastics in Quinte only, and is sent to a U.S. market. Initially, B.F. Goodrich purchased this material for approximately $150 U.S. per tonne (F.O.B. Quinte) (Kuracz, Oxy Chem). Now, Oxy Chem (Amsterdam, New York) accepts the material (F.O.B) for approximately $66 US per ton ($60/tonne) (Quinte, 1993).

Mixed Plastics:
Markets for mixed plastics are not strong because there are relatively few opportunities for their use. Recyclers can typically find markets for polyethylene, and like to remove it from the plastic stream (because of it's higher value). The third bale of material which remains contains plastics for which economic end markets have not been found to date. Superwood at one time manufactured plastic lumber from post-consumer mixed plastics. Financial problems coupled with the high cost of the plastic lumber forced the company's closure in 1991. The initiative was also impacted by process barriers which demanded high HDPE and LDPE (60% content).

Although it does not presently accept GTA material, Plas-Re-Tech charges $65/tonne to purchase plastic feedstocks, offering lumber back to suppliers at $45/tonne. This is approximately twice the price of conventional lumber. Published plant capacity is 2.4 tonnes per year (O'Lane, Plas-Re-Tech).

Some GTA mixed plastics are sent to Cascade Replas in Drummondville, Quebec. This facility is expected to process 4,400 tonnes in 1993 (Perrier, Cascade Replas). Cascade pays $40-60 tonne F.O.B. Quebec for post-consumer mixed plastics. The HDPE and PET must be left in bales. In other cases, mixed plastics are being shipped for free to China for use in the production of shoes and other products. Segregated plastics command better prices than commingled plastics.

Technical Challenges

Plastic recycling faces many challenges associated with sorting, washing, and contaminant removal, i.e., metal pieces, labels, adhesives, etc. One of the major challenges facing the plastic industry is to provide an effective automated sorting system that is affordable to most recyclers. Automated sorting is still in the early stage of development and remains an expensive proposition for most recyclers (White, 1992 and Minnesota Office of Waste Management, June 1992).

Conventional sorting systems generally permit two resin types to be successfully separated at a time but cannot economically or efficiently separate a variety of resin types at the same time. Most sorting and processing systems currently rely on manual, hand-sorting where workers selectively remove plastic containers as they move along a conveyor line. The process is labour intensive and considered an inefficient use of resources (Minnesota Office of Waste Management, June 1992).

Recyclers/reclaimers also use technologies that separate plastic resins based on their different densities. Float-sink tanks are used to separate HDPE and

PET, which have significantly different densities. The process, however, cannot effectively separate PVC and PET, because they have virtually the same densities. Light media separation (alcohol and water) techniques and cyclone (dry and wet) techniques are also used to separate plastics. Both of these methods rely on the different densities of the plastics (Hock, AEL).

Economic Challenges

Oil prices affect the price of virgin resin. Typically, an increase of $1 per barrel increases virgin plastic prices by 2.2 to 4.4 cents per kg (Edgecombe, EPIC). In 1992, a surplus of virgin material was available on the market due to new capacity brought on line. This coincided with an increased supply of post consumer resin. Recyclers/reclaimers had a difficult time competing with low-cost virgin materials; in some cases, the recyclers/reclaimers went out of business. At the present time, there is no clear incentive for intermediate processors to sort out the non-PET/HDPE resins when the materials have limited market value and represent only approximately 7% of all plastics (Proctor & Redfern Limited, 1990). It is anticipated, however, that virgin prices will rise throughout 1993 which will help the plastic recycling industry compete with the virgin material producers (Nanda, Metro Toronto Works Department).

Future Trends For Plastics

Stronger end-use markets must be developed through private and public sector initiatives, such as purchasing specifications and policies. An article in a document published by the New York State's Office of Recycling Market Development indicates that future plastic recycling will require the development of specialized, separation and processing centres that can operate at the necessary economy of scale to ensure secure supplies of resin types at lower costs. The article further states that if the plastic industry fails to develop cost competitive separation systems, the onus will be placed on government agencies to introduce regulatory measures such as resin bans, packaging regulations, and taxes (The Market, April 1993).

A number of recent industry initiatives may encourage greater activity by the plastics industry to develop the plastic recycling market The Grocery Products Manufacturing Canada (GPMC) Packaging Stewardship Model announced in November 1992, will require significant changes in material management by brand owners. In essence, the model requires brand owners to assume greater responsibility for the generation and management of packaging wastes. Levies on packaging will be used to fund recycling programs and promote greater end-use market development for packaging materials including plastics (GPMC, 1992).

Reduce

In the past 10 years, there has been a general trend towards lightweighting of plastic packaging, through structural design or switching to other plastics. For example, PP is stronger than HDPE and by using the lighter, stronger plastic, where viable, a 30% reduction in weight can be achieved. Weight reduction is also possible for film. A laminate of two polymers can provide advantages such as reduced weight, improved barrier properties and superior strength/toughness.

An overall reduction in the generation of waste plastics is unlikely in the short-term. Existing plastic packagers continue to lightweight their plastic products. These new, lighter packages are expected to displace other packaging materials such as corrugated containers and glass. The industry expects a 6.3% increase per year in the plastic packaging market - representing about 40% of all Canadian consumption of resin (Proctor & Redfern Limited, 1990). As a result, the overall percentage of packaging materials which are plastics should increase as new plastic products enter the market.

Reuse

Refillable PET bottles are currently widely marketed in Europe and Central America as a soft drink package. Demonstration projects are on-going in a couple of communities in Ontario on the feasibility of using refillable plastic bottles for a number of uses (soft drinks, milk, etc.).

Plastics may absorb some of the contents of the bottles and that may lead to potential contamination problems when a plastic container in reused. Technologies are presently being developed to detect and remove contaminants. Successful application of these technologies is expected to increase the use of refillable, reusable plastics, particularly PET (Powell, May 1992).

Companies such as Proctor and Gamble, have introduced concentrated liquid detergents and fabric softeners in refillable pouches to permit reuse of the original plastic containers. Other companies have introduced reusable pails and pallets which can be sent back to the supplier for refilling/reuse; for example Pepsi-Cola and Coca-Cola have begun to ship soft drinks in plastic, returnable crates. (Recycling Today, November 1992).

Recycle

A key to successful recycling of plastics is to be able to economically identify, segregate, and wash the plastics. Automated sorting equipment is slowly becoming commercialized and over the past several years new developments in mechanical sorting have emerged:

- The "bottlesort" system relies on a computer controlled sensing device that is able to sort plastic bottles into three streams of plastic,

including the separation of PET from PVC, the separation of PP from HDPE, and mixed colour separation. Once the sensory device has identified the plastic property, the position of the bottle is tracked as it moves along a conveyor line and forced air is used to eject the plastic container into the appropriate collection container (Woods, July 1993 and Modern Plastics 1992).

- The "vinylcycle" system separates PVC from other plastic bottles using an electromagnetic screening process. The presence of chlorine in the PVC triggers a computer-controlled air jet device that emits a stream of air at the PVC bottle to remove it from the other plastic containers (Powell, August 1992 and Modern Plastics 1992).

- A relatively new technique "Polysort", being developed is capable of sorting six categories of bottles, including polyproylene, PVC, natural HDPE, coloured HDPE, green PET and clear PET. The technology sorts by differentiating between colours and resins using two sensors. A microprocessor analyzes the information from the sensors and then sends a signal to the appropriate position along the conveyor for the plastic container to be shot into a storage bin (Powell, August 1992 and Woods, 1993)

Mixed depolymerization, whereby mixed plastics would be melted down to basic polymers, streamed into the various resin groupings and then used for a wide number of applications is not yet proven by the plastics industry. Dr. Fred Edgecombe, EPIC, suggests that this process may be successful in North America in five or six years. Presently, Canada has few facilities capable of using this process and may be limited by the plastics processing infrastructure.

Post-consumer plastics are being tested as a feedstock for a variety of products. Some carpet manufacturers use recycled PET in carpet fibre (RIS, 1992). Post-consumer paper, (i.e. old newspaper), is being combined with plastic to produce a composite that is claimed to be stronger than virgin plastic. Potential uses include building and structural applications. Automobile manufacturers, such as BMW and GM, are using post-consumer plastics in car parts, such as interior and bumpers (Resource Recycling's Plastic Recycling Update, September 1992).

Market Outlook for GTA

Based on the previous discussion, it is clear that markets for plastics present a problem, particularly if Expanded Blue Box or comprehensive three stream collection programs are considered or implemented by a number of GTA municipalities. The quantities of mixed plastics recovered would likely not find a market under current circumstances. This may be a limiting factor for some municipalities. The IC&I sector is unlikely to embark on plastics recycling programs until markets are secured for the materials involved.

PET and HDPE are more readily marketed materials, but the remaining five plastic types, and any composite packaging materials are considered to have underdeveloped markets, and require a strong market development policy.

Markets for Organics

Organic materials can be grouped in three primary classifications, according to the potential end uses of the material. These three categories are food waste (including residential and IC&I food, as well as food production waste), yard waste (including brush, trimmings, leaves, grass etc.) and compost.

Food and yard waste combined account for one-third of all residential and roughly 9-10% of the IC&I waste stream.

In comparison to traditional recyclables, end uses and markets for organic waste are just emerging. Potential end uses are diverse and several potential end users are just beginning to learn of the availability and applicability of processed organic materials as replacement for traditional materials. Extensive telephone research of potential end users was conducted, however accurately defining the present or predicting the future market for reprocessed organic waste is not yet possible.

To date, the majority of finished compost material, produced mainly by municipal leaf and yard waste sites has been used internally by municipal parks and public works departments and made available to local citizens at free giveaway days. While these end uses have proven to be adequate in handling the limited amounts of finished compost that have been produced to date, more secure long term markets will be required with any expansion of organic waste collection and processing. (Note that industry contacts in this more advanced market were unable to estimate the extent to which compost can be used as a soil supplement for municipal park lands).

For those paying markets that exist, specifications are strict. For markets where the end use is tied to food production, consistency and quality of the finished material are essential.

Existing and potential end uses for organic materials include ones for which revenue is received, ones where the end user charges a fee for accepting the waste, and those where product is given away. This encompasses material for which there is a present market value (such as some high quality compost and oils generated through the rendering process) to leftover food diverted from the waste stream and used for human consumption.

The Ontario Ministry of the Environment and Energy (MOEE) has established a hierarchy for the management of residential and IC&I wet wastes. (Ontario Waste Reduction Office (WRO)). The MOEE hierarchy of organic waste diversion (in order of the highest value usage) is presented below:

1. Reduction
2. Primary Use
3. Recycling which includes home or on-site composting, use of food waste for animal feed and application of organic waste directly on the land
4. Offsite aerobic or anaerobic composting, and animal feed and landspreading where waste is transported away for processing from the point of origin
5. Ethanol production, where animal feed is produced as a bi-product
6. Conversion of organic waste to liquid biofuels
7. Volume reduction, through either anaerobic or aerobic means
8. In-sink garburators for primarily food wastes
9. EFW
10. Landfill
11. Incineration
12. Export

End uses and paying markets for organic materials are sorted according to these categories. However some of these include categories which are considered inappropriate or beyond the scope of this report. Ethanol and liquid biofuel production are not considered of direct application to the organic wastes of interest to this study as these products generally are produced from specialty corps, rather than from food or yard waste In-sink garburators are not considered as an appropriate method of organic waste management for this study and are similarly not discussed in detail. EFW, landfill, incineration and export and outside of the scope of this study.

This section of the report therefore focusses on the potential diversion and/or end uses for residential and IC&I food and yard waste presented for the first four diversion categories above.

Markets and End Uses for Food Waste

Food waste consists of animal, vegetable, fruit scraps, surplus or spoilage, that is generated through the preparation and the consumption of food, by both the residential and IC&I sectors. As with IC&I wet waste, food waste management in general is guided by a hierarchy of end uses. These include:

- source reduction
- human consumption
- animal consumption
- rendering
- landspreading
- on-site composting
- off-site composting

This hierarchy is based on the highest and best use of food waste to utilize the nutrients to the greatest extent possible.

Techniques used and achievements made in the GTA for waste diversion of food and yard waste management are presented below. The list based on extensive telephone research, is comprehensive but not exhaustive, as additional small scale and pilot projects are likely to be underway.

Source Reduction
The production of less waste is of first priority in the MOEE wet waste hierarchy. Through a program sponsored by the Ontario Green Workplace, efforts have been undertaken to reduce the amount of food waste generated at government institutions through the modification of menus and changes to the quantities of food prepared. (Manager of Guelph Correctional Centre, 1992). This has been particularly successful in a number of correctional facilities.

Human Consumption - Gleaning
An expanding end use for surplus or off-spec food in good condition and from known reliable sources is food banks and social agencies. However, liability concerns on the part of the suppliers as well as the redistribution agencies continue to be an issue. While no formal provincial clearinghouse exists for this type of waste, organizations such as Daily Bread and Second Harvest act as brokers for receiving and redistribution.

Toronto's Daily Bread Food Bank regularly receives truckload quantities of surplus non-perishable food, including breads and pasta, which is stockpiled for future use or redistributed in smaller quantities to other food banks within the GTA. Perishable food is also accepted, although it is not as easily dispersed to outlying social agencies, because of a lack of adequate refrigeration equipment at some of these facilities. (Nash, Orangeville Food Bank, 1993).

Second Harvest, a non-profit organization dealing specifically with perishable food, locates, collects and delivers perishable food to various social service agencies in the Metro Toronto area. Major donations come from small green grocers, farmers markets and fast food establishments. In their 1991-1992 fiscal year, Second Harvest diverted about 500 tonnes of perishable food from landfill. Second Harvest is currently working with Transport Canada and health authorities to collect surplus milk and other packaged food from Air Canada and Cara Foods. Organizations similar to Second Harvest are in operation in Winnipeg, Calgary and Vancouver.

Animal Feed

Diversion of post industrial organic waste to commercial manufacturers of animal feed has occurred for a number of years. Examples of industries which tend to carry out this practice include flour mills, and manufacturers of confections, bakery goods and cereals. Depending on the digestibility, available volumes and the nutrient levels of the waste product, the generators of the waste may receive revenue from the feed manufacturer, however, prices have fluctuated historically.

Some packaging industry culls and grocery store produce wastes generated primarily in the Golden Horseshoe area are currently being directly diverted for use as cattle and pig feed, although estimates of the amount diverted from the GTA are not available. Suppliers of this food waste typically do not receive any revenue for their material, and may even have to pay a nominal amount to cover transportation costs.

Agriculture Canada regulates the use of certain food wastes as animal feed, and requires that scraps be boiled before they are fed to swine or poultry. Swine feed must originate in the domestic IC&I sector, must not be rotten or moldy, and must be free of foreign materials (plastics, glass, knives, forks etc.) that might be injurious to the animal. Improper cooking of this waste can result in disease transmission between livestock and humans and among different types of livestock (such as salmonellosis). (Peer, 1992).

Hy Hopes Farms in Ajax, Ontario, runs a swill feeding operation licensed by the federal government. For a fee, the owner of this hog farm collects about 135 tons of organic material for 25 IC&I locations (including hospitals, restaurants, etc.) each week. Organic material is boiled and prepared according to government guidelines and is fed to the pigs. (Bibb, Hy Hopes Farms, 1993).

Additional research is required to help build the necessary infrastructure, create stable markets, and to develop guidelines and standards (ie. nutrient value and contamination issues) regarding the suitability of certain foods for various livestock. However, expansion of this diversion alternative is also influenced by prices received by farmers for their livestock.

Rendering

Rendering is a long standing (approximately 200 year old) practice that involves cooking waste to remove moisture and separate fats and liquids from solids. The raw materials have until recently been primarily meat and meat by-products. Some rendering plants now accept restaurant food waste, production waste and other materials that may not be appropriate for any of the above uses.

The process produces a stable, inert product. All types of organics can be accepted for rendering, (including breads, tissue etc.) although dry, high protein fat is preferred for rendering. End uses include oils (for use in soap, cosmetics, animal feed etc.) or glycerine, which is used for a range of products (including soaps, wet naps, crayons, shoe polish etc.)

Approximately four renderers and an additional five "edible renderers" that render fats for the edible food business, operate in or near the GTA. Rothsay (formerly ORENCO) is the largest rendering company processing food waste from the GTA, with a plant located in Dundas. It processes approximately 40% of materials rendered in the area. If demand was adequate, ORENCO would be prepared to expand to three times its present capacity to absorb demand (Rusk, Rothsay).

Systemic costs of energy, transportation and a shift in eating habits have contributed to a stagnant, if not reduced demand for traditional rendering. End markets for animal feeds produced through the rendering process are dwindling, although Canada remains a net importer of proteins for animal feed. This is because the costs of rendering are not competitive with cheaper forms of (lower quality) proteins such as soya meal. Renderers may pay from \$0.13-\$0.16/lb (\$286 to \$352/tonne) for "dry fat" but can charge from \$80 to \$140/tonne to process other, lower quality materials (Rusk, Rothsay).

Due to factors listed above, relative capacity in rendering plants is increasing. For this reason, a new stream - organics rendering - is in the early stage of use. Proteins rendered from organics are used as a supplement in chicken feed, hog feed and beef feed. However, this is a low protein source, when compared with meat products and demand is not expected to increase dramatically within the near future.

Off-site composting of food waste

Food waste can be source separated at the point of generation, and then taken off-site for composting in a centralized facility in either an open-windrow system, or in an in-vessel (aerobic or anaerobic) system. Markets for finished compost produced by these methods are discussed in a later section.

Landspreading of Organic Wastes
While the application of sewage sludge directly on to agricultural land has taken place for many years, application of some types of clean post-industrial organic waste is in the developing stages. Examples of these types of waste include:

- grape pressings and winery lees
- wood pulp and paper processing wastes
- food and canning industries' processing wastes
- culled vegetables
- leaves

The major disadvantage of this method over other diversion alternatives, particularly centralized composting, is the inability to apply wastes to the land continually throughout the year. The Ministry of Environment and Energy recently released new guidelines for the land application of organic materials other than sewage sludge. Some changes in the new guidelines include lower limits for heavy metals, and restrictions regarding the proximity of landspreading facilities to other landuses.

There are currently 12 farms licensed for land application in all of Ontario. Leaves collected in some municipalities in Halton Region, as well as chipped Christmas trees from the City of Brampton are being applied directly to agricultural land. These municipalities do not receive revenues for this material. Instead, diversion through landspreading is viewed as a means of saving the costs associated with centralized composting activities.

Home and IC&I On-Site Composting
Home (backyard) and on-site composting are viewed as a preferable approach to centralized composting for managing organic wastes for a variety of reasons:

- wastes need not be collected and transported to a centralized facility
- any required handling, processing and labour is provided by the generator
- the generator of organic waste becomes the "market" for finished compost

A number of pilot programs are underway to measure the impact of backyard composting on the amount of residential waste being put out at the curb. First year results from a project carried out in a neighbourhood in Pickering indicated that approximately 16% of (primarily) food waste was diverted through backyard composting. Costs to supply and deliver a free backyard composter and kitchen storage bucket, and to provide minimal educational support were estimated to be $23.16/tonne before any provincial subsidies were taken into account. (Biocycle, May 1991).

The YIMBY program (Yes In My Back Yard) conducted in Centre and South Hastings in 1992 experienced similar results. Acceptance rates for free backyard composters averaged around 85%, and costs for promotion and to supply and deliver a free unit were about $38 per unit, before incorporating any grants. (Quinte Regional Recycling, 1993). A follow-up survey is planned for the summer of 1993 to measure the sustainability of backyard composting behaviour.

An aggressive home composting education program is essential in creating awareness of the value of compost. This recognition will in turn improve future demand for compost products, and help to strengthen markets.

Although not as prevalent as home composting, on-site management of food waste by IC&I generators, in particular institutions, is expanding. A number of manufacturers of home composting units have developed commercial sized units, more suitable for handling larger amounts of food wastes. Constraints to the expansion of this diversion alternative include lack of available space, purchase price of the units, and the level of ongoing maintenance that is required.

Through the Ontario Green Workplace program, on-site demonstration projects were developed in 1992 at eight government facilities. One of these facilities was the Mimico Correctional Centre. Mimico is testing one prototype in-vessel composting unit (the Ecolyzer) which is designed to accept up to 100 pounds of food waste per day, and to require as little as 15 minutes a day for ongoing maintenance. Work is also underway to install another type of in-vessel unit at the Ontario Science Centre that will be capable of composting all of the food waste generated at the Centre as well as wastes from Queen's Park and the Legislative Building. It is expected that this facility will be operational in the summer of 1993.

A summary of organics processing facilities in the GTA area is presented in Table H-9, Organic Waste Processing and Utilization Capacity in GTA.

Table H-9

Organic Waste Processing and Utilization Capacity in GTA

Facility	Location	Capacity (tonnes/ yr) [1]	Process	Materials Accepted	Issues/
Scott's Farms	Halton	• 25,000	• windrow composting	• leaf and yard waste, some wood waste and limited paper • primarily IC&I with some municipal/ residential	• awaiting appeal (August '93) of C of A to re-establish food waste composting • presently operating at one third capacity
Altreat	Orangeville	50,000	composting	• yard waste manure filter cake	• strictly IC&I waste • operating at less than 1/2 capacity
George Sant & Sons	York (Kleinburg)	• 80	• open windrow compost	• leaves	• wants to receive leaves from GTA municipalities
Hy Hopes Farms	Durham (Ajax)	• 1,470	• swill feed	• food waste • hospitals, restaurants etc.	• operating over 60 years
Barret Farms	Durham (Brooklin)	• 1,980	• swill feed	• Metro IC&I	
Rothsay	•Dundas	• 104,000	• rendering		• prepared to expand if demand and material is available
Daily Bread Food Bank	Toronto	• not stated • can increase	• human consumption	• dry food	• voluntary
Second Harvest	Metro	• 450	• human consumption	• IC&I	• accepted 450 tonnes in 1992 • could expand if funds available
Material Diverted through Municipal Programs in 1992					
Durham		8,045			
Halton		15,000			

[1] Based on 250 day/year operations.

Metro[2]		71,062			
Peel		6,718			
York[3]		50,000			
Proposed IC&I Composting Facilities					
Canada Compost Inc.	York (Newmarket)	• 120,000	• in-vessel compost (anaerobic digestion)	• primarily IC&I food waste (with some municipal wet waste)	• proposed for 1994 (likely 1995)
SWEDA Farms	Durham (Blackstock)	• 72,000	• compost	• chicken manure (on-site, proposed leaves, grass, paper sludge etc.	• proposed expansion; presently operate indoor, in-vessel process for organic fertilizer
Metro Toronto	Metro	• 12,500	• in-vessel compost		• existing facility at Dufferin Transfer Station • proposed Fairfield Digester use
Mammone Disposal System Ltd.	York (Maple)	• 15,000	• windrow composting	• OCC/-wood waste/ yard waste, manure • from grocery and other IC&I sources	• operating in-vessel process since 1967 • proposed upgrade -- awaiting confirmation for expanded C of A
Proposed Municipal Composting Sites					
Metro		130,000			• 500 tpd
Peel		69,000			• may be shared with Halton
Halton		• capacity not available			• may be shared with Peel

Sources: Personal communications with industry contacts referenced at conclusion of chapter and with municipal officials.

2. Includes Avondale Compost site near Keele Valley as well as sites in Scarborough, North York and Etobicoke.
3. Operated by Miller Waste.

Markets and End Uses for Yard Waste

Yard wastes refer to grass clippings, brush, leaves, trimmings and other organic landscaping wastes. It excludes tree trunks and cut lumber.

The hierarchy for management of leaf and yard wastes is as follows:

- source reduction
- direct use of landspreading or chipping
- composting

Reduction

Source reduction opportunities exist to encourage residents to reduce the amount of yard waste they generate. Public education plays a key role in all of these alternatives.

Grasscycling, a waste reduction technique initially developed in Texas, involves leaving grass clippings on the lawn. Residents are educated on proper mowing, fertilizing and watering practices, through door-to-door distribution of information materials, radio and television ads, newspaper articles etc. In 1990, using the Texas program as a model, Montgomery County, Maryland was able to keep about 62% (25,000 tons) of all residential grass clippings out of the landfill.

The City of Waterloo has been promoting grasscycling since May 1991. In 1992, the City conducted a research project to identify the most effective ways to divert yard waste from landfill. The research showed that implementing an aggressive grasscycling promotion and education program was the most cost-effective way to divert grass clippings from landfill. Using volunteers to distribute educational material, the total cost of this form of reduction was estimated to be about $1 per household. The City estimated that through implementation of a grasscycling program, and a landfill ban on grass clippings, between $25,000 to $80,000 would be saved annually on tipping fees, garbage collection costs would be reduced, and between 500 and 975 tonnes of grass would be diverted each year from landfill (based on 475 kg of grass clippings per household per year) (City of Waterloo, March 1992). As a comparison, costs for providing separate collection for grass clippings and for composting at a centralized facility were estimated to be approximately $140/tonne in the Region.

One method to reduce the quantity of leaf and yard waste generation is to promote xeriscaping, which is lawn and garden design to minimize water and fertilizer use, utilizing plant species which generate very low waste quantities, sometimes due to slow growth rates. This is more applicable for new developments, and may suit the lifestyles of residents not interested in high maintenance lawns and gardens.

Home and On-site Composting
Home composting activity can divert significant quantities of leaf and yard waste. In some neighbourhoods, particularly those with mature trees and landscaping, one or two backyard composters may not provide adequate capacity for the leaf and yard waste generated. Depending on the size of the unit, on-site composting operations may be capable of handling all the leaf and yard waste generated by an IC&I establishment. Home and on-site composting requires the addition of carbonaceous material like leaves and small twigs to balance the high nitrogen levels typically found in residential food waste.

Source Separated Leaves and Brush
A few municipalities in the GTA arrange for nearby farmers to accept their fall leaves, for plowing into fallow fields. In addition, leaves are delivered by some municipalities to Scotts Farms, a private food waste composting facility, where they are stored and used as a bulking agent for incoming loads of food wastes.

Chipped brush and tree limbs are frequently used by centralized food waste composting facilities as an amendment material. While most centralized compost facilities charge a tipping fee for loads of organic waste entering their site, often the tipping fee for clean loads of wood chips is reduced to encourage deliveries.

Markets for Compost

Developing end uses for compost is a gradual long term task, that requires educating potential end users of the properties and qualities of the product and correspondingly, developing a product that suits the needs of potential end users. (WRAC). The key to marketing organics is to produce a very high quality finished material; any below standard material will be difficult to market, especially as availability increases. (Taylor, June 1993).

Compost produced in Ontario must be tested against the Ministry of Environment Interim Guidelines for the Production and Use of Aerobic Compost. (Ontario Ministry of the Environment, November 1991). These guidelines, which were adapted from the Ministry's standards for measuring metals in non-contaminated rural soils, are generally perceived to be the most stringent in the world. The guidelines create two grades of finished compost. The highest grade, referred to a "compost product," allows for unrestricted distribution of finished material. This grade would include compost that was suitable for sale (although it may be further regulated by the Federal Fertilizers Act), or to be given away to homeowners. A second grade, "controlled compost", places restrictions on the sites where compost can be applied. Any material that exceeds the guidelines for controlled compost must be handled as a waste product.

Other criteria that end markets use to measure the quality of finished compost against include:

- soluble salts and sodium content
- stability
- C:N ratio
- available nutrient content
- particle size

High grade compost can command about \$8/cubic yard or \$5/tonne. (Taylor, June 1992). Based on experiences of the Mississauga Composting Pilot Project, prices for finished compost will vary according to time of year, transportation costs and quality of the finished product. To date they have ranged from \$4 to \$15/cubic yard. (Rivers, 1993). With the expansion of composting activities, it is anticipated that current prices will drop. However, experts predict that there will never be a time when generators will have to pay to get rid of high quality product. (Taylor, June 1993).

Depending on whether chipped brush or other woody organics are mixed in the feedstock, compost product can be used as a mulch or as a substitute for peat moss, or other soil amending materials. To date, mulches have been more difficult to market than high quality leaf compost. (Taylor, June 1993). An attempt was made to contact landscaping and horticultural associations and other sources that could help identify quantities of composted material that are presently being utilized in the GTA or that could provide markets for future usage. In many cases, this information was not possible to obtain. However, some of the more common current and potential uses for GTA are described below.

Municipal Public Works and Parks and Recreation Departments

Several of the municipal parks departments in the GTA have, for a number of years, been using finished leaf compost , sometimes blended with topsoil, as top dressing for their lawns and flower beds. Information obtained through telephone conversations with some Parks Departments located within the GTA, indicated that demand exceeds current supply although specific figures were not available. Public Works Departments use finished compost as a substitute for topsoil, to repair excavations.

For the above end uses, the compost manufacturer (in most cases, the municipality itself), receives no revenue for the finished product, however, compost may displace purchases of screened topsoil. Because records of where compost is actually used could be easily made, this type of end use may prove to be suitable for application of controlled compost.

Private Landscapers and Developers

Historically, landscapers and developers in the GTA have represented the largest purchasers of available high quality compost, for top dressing, mulch, and use as a soil amendment. This market is expected to improve, as the availability of topsoil decreases.

Greenhouse and Potting Mixtures

High quality compost can make up to 40% of the growing medium for plants. Of special concern however are the consistency of nutrient levels and soluble salt concentrations. (Bates, University of Guelph, 1991). AllTreat, a private composting operation located in Arthur, Ontario, currently produces specialized blends, some of which are designed to replace peat and composted manures. Various mixes are now being marketed to the public through grocery stores and garden centres. (Dempster, March 1993).

Field Crops, Commercial Fruits and Vegetables

To date, in only a few instances, finished compost has been applied to producing agricultural land. However, it is by far the largest potential outlet for high quality product. While this potential outlet is not likely to pay high prices, it is capable of utilizing very large quantities if it is delivered and spread at no charge. (Bates, 1991).

If compost is used to top dress fields, a pH of 5.7 is required. Field crops are selected according to existing soil conditions, so it is essential that any top dressing of compost does not alter these conditions.

Landfill Cover

According to an American study team (Buhr et al, January, 1993), landfill cover and surface mine reclamation provide an immediate use for municipal compost that can, in theory, be applied while other markets are being developed. These markets are said to offer a potential stable market for low grade and non-uniform compost products.

Discussions with the IWA landfill site consultants indicate that the landfill approach under consideration would ensure that the amount of material excavated for the site balances with the requirements of daily cover and capping for the site. Compost may be used as an occasional soil amendment for revegetation. An additional 6 inches of compost is estimated as a possible use in the capping process (Alton, Fedec, Theodorolus, March, 1993).

Should compost be utilized in development of the cap at any of the future IWA landfill sites, future uses of the area (i.e. recreational or industrial) would determine what type of compost (low, medium or high grade) would be required. If a high grade compost were required, it would require high quality control on the incoming feed stream to the site.

As presently planned, the GTA landfill sites would not require compost, either as daily cover or for landfill capping (Alton, Fedec, Theodorolus, March, 1993). Thus, while landfill cover does provide a good potential end use for composted material, as presently planned, the IWA landfill sites do not anticipate any significant use of the material.

Market Outlook for Organics

The above section has described a number of possible end uses for organics (food and yard wastes) generated in the GTA. Some of these depend on composting of the organics, and the end uses available will depend on the quality of the finished compost. There appears to be adequate capacity to absorb high quality compost at prices varying from zero to $10/tonne.

Lower quality compost has more limited applications such as landfill cover, or rehabilitation of areas not intended for residential development. Again there is likely to be adequate capacity to absorb this material at zero revenue. The costs of transportation may have to be absorbed by the compost generator. The higher uses of organics should be explored prior to directing food or yard waste to composting. These include re-distribution, food waste, or landspreading of food wastes and leaves, where viable.

Markets for Metals

Steel

Introduction
Steel recycling is a well-established practice within the industry.

Definition
Tinplate steel is a ferrous metal commonly found in the residential and IC&I waste stream. This includes food and beverage cans, aerosol containers and paint cans. Post-industrial and post-use forms of ferrous metal include heavy industrial scrap metal (steel supports and reinforcement bars), automobiles and durable household appliances. Reprocessed steel may be utilized in, but is not restricted to closed loop recycling.

Traditional Steel Market Overview
The demand and end market capacity for recycled tinplate steel is well-established in the GTA. The Canadian Steel Can Recycling Council (CSRC) acts as an umbrella organization for Ontario steelmakers. It reported that available tonnages in the province are unknown, because the number of steel cans (filled and unfilled) is unknown. Demand for tinplate steel, by CSRC members and Metals Recovery Inc. (MRI) outpaces supply. MRI is major processor that receives tinplate steel, separates the materials and markets the tin and steel. MRI and CSRC both state that the market will be able to absorb

any new supplies of cans which might become available from IC&I programs, and increased consumer participation in recycling programs.

Current Steel Markets Overview

Recycled steel food and beverage cans are melted with other scrap metals and used for a variety of applications, such as in the production of flat-rolled steel and reinforcing bars. Tinplate steel may be marketed to either of steel mills, detinning operations or iron and steel foundries. In these processes, cans may be either mixed with other scrap to form a scrap charge (which is mixed with virgin ore in blast or arc furnaces to form new steel products), de-tinned for tin-ingots and steel or simply flattened and baled prior to sale.

De-tinning operations extract tinplate coating from the steel. The coating is sold to the tin industry and detinned steel is sold to the steel industry. Iron and steel foundries generally use 30% to 40% scrap steel mix in the fabrication of cast and molded parts for industrial uses. MRI/Philip Environmental is a major end market for secondary tinplate steel. Although MRI is not a steel manufacturer, the company de-tins steel, and markets both the recovered steel and tin.

The market for tinplate steel has been stable, with ample market capacity provided by the steel mills. Steel production is affected by the overall level of economic activity especially in the automotive, construction and transportation sectors.

The Canadian Steel Can Recycling Council acts as an umbrella organization for Ontario steelmakers. Key markets include Stelco, Dofasco, and Algoma which are three large steel smelters located in Ontario. Each company uses recycled tinplate steel to manufacture new steel. Typically, containers and manufactured products that contain recycled steel will incorporate a mix of 30% recycled material, of which 10% derives from post consumer sources (Moore, Dofasco 1993).

Tinplate Steel Prices

CSRC reports prices of $70/ton for loose or baled cans, $90/ton for cans densified (to 1,200 kg/m^3). Prices are guaranteed by Stelco and Dofasco. (MRI did not wish to discuss prices paid for metal cans).

Market prices were not available at the time of writing for other forms of steel scrap. However, sources report that no significant changes in pricing are foreseen at this time.

Diversion Trends

Recycling of tinplate steel continues to rise in north America as greater numbers of consumers gain access to depot and curbside recycling programs. For example, in Ontario the steel can recycling rate is estimated at 70%.

Source reduction has been enhanced through lightweighting efforts on the part of steel can manufacturers. Steel cans have been reduced in weight by 30% in the last few years. Further reductions are not anticipated. The Canadian Steel Can Recycling Council has estimated a current post-consumer steel content of tinplate steel cans at 10%, with an anticipated upper limit of 25-35%. The upper limit results from a technological requirement that demands a fixed ration between liquid iron and post consumer scrap which ensures that the required chemical reaction takes place.

The CSRC reported the following tonnages received for recycling:

1986	—	3,200 tons
1987	—	4,900
1988	—	10,900
1989	—	18,000
1990	—	28,500
1991	—	52,000 tons (CTRC estimated an additional 8,000 tons of cans were exported, and Algoma Steel received approximately 610 tons)
1992	—	74,000
1993 projections	—	90,000 projected target

MRI did not provide recycled tonnages available, due to confidentiality concerns.

Future Market Trends for Steel

Demand for steel for re-manufacturing new steel products is expected to remain strong. Opportunities for local market development using secondary tinplate are limited. No new uses for recycled ferrous metal are foreseen at this time.

Some packaging materials such as aerosol and paint cans cannot be collected in recycling programs due to potential fire/explosion hazards. While they are accepted in a growing number of household hazardous waste programs this type of restriction does presents a barrier to further recovery of this material.

Market Outlook for GTA Generated Tinplate Steel

It is anticipated that sufficient capacity exists within local mills to absorb any increases in GTA recovery of secondary steel.

Markets for Aluminum

Introduction

Aluminum in the waste stream consists of both consumer and industrial products. The intrinsic high value of aluminum has always created a demand for the metal. The recycling infrastructure for each type of aluminum product is different. For that reason this summary of aluminum discusses recycling of consumer products and industrial aluminum products separately.

Definition

Recycling of scrap aluminum (i.e. industrial aluminum) is a well-established practice. A large portion of secondary aluminum is generated directly through the IC&I sector. Post-use industrial products such as aluminum building products, automotive parts, trailers, aeronautical parts, roadsigns and supports have also been reprocessed. Consumer products that consist primarily of beverage cans with some aerosol cans and rigid and flexible products such as pie plates and foil wrap also provide feedstocks for aluminum recycling. Additional sources of aluminum is also generated in the residential sector include aluminum siding, lawn chairs and barbecues.

Current Market Overview for Aluminum Used Beverage Containers

The generation of aluminum beverage cans in Ontario from soft drink, domestic and imported beer is estimated at 13,700 tonnes. A smaller, but unknown quantity of juices, imported beverages and aluminum food cans are also generated (Confidential Client). The primary market for aluminum beverage cans is Alcan Recycling in Brampton. In 1991, Alcan handled 91% of the recycled aluminum cans collected in Ontario. Aluminum cans are processed into bales which are transported to one of Alcan's re-processing facilities in Oswego, New York or Berea, Kentucky for melting into aluminum ingots. Aluminum ingots are the basis from which aluminum can sheet is produced. The rolled can sheet is used for producing new beverage cans.

Material Recovery Industries (MRI) in Hamilton accepts mixed loads of steel and aluminum cans. MRI (owned by Philips Environmental) separates the steel from the aluminum and ships the materials to market. MRI sells the recovered aluminum to Alcan and other United States markets. Quantities handled and prices paid were not available from MRI.

Aluminum cans are collected in all GTA curbside recycling programs. Most aluminum cans recovered in the GTA are exported to the United States for reprocessing into can sheet. Export is necessary because there are not sufficient quantities of aluminum in Canada to justify building a facility. The primary American markets include Reynolds Aluminum, Golden Recycling, Anheuser-Busch and Connecticut Metals (Confidential Client).

Within the GTA, aluminum foil is only collected through the curbside collection in Mississauga. The generation of aluminum foil products in Ontario is estimated at 4,700 tonnes. An estimated 7.5 million or 300 tonnes of aluminum aerosol products are also consumed in Ontario (Confidential industry representative 1993). Aluminum foil specifications require that foil and rigid containers consist of clean, old, pure, uncoated, unalloyed aluminum. The aluminum foil and rigid containers should be free of leftover food and anodized foil, radar foil, paper, plastics or any other foreign materials.

Metro municipalities are planning to add foil to programs within the next year. Alcan and Metro Toronto are sponsoring an aluminum foil recovery program through "Meals on Wheels". Foil that is collected in the GTA is currently sent to the Alcan plant in Guelph.

Specifications for scrap aluminum vary from market to market and depend on the type of aluminum alloy purchased. For example, used beverage container material must be magnetically separated and free of steel cans, tramp iron, lead, bottle caps, plastics, oxidization, sand, paper, glass, wood, dirt, grease, trash and other foreign substances. Baling and densification of aluminum cans is acceptable. Bale densities are between 14 to 22 lbs. per cubic foot with a minimum bale size of 30 cubic feet. Densified aluminum can biscuits are to be between 30 to 45 lbs. per cubic foot and of a uniform size (Alcan Recycling, April 1991).

As with steel aerosol cans, aluminum products such as aerosol cans and tubes are not currently collected through curbside or IC&I recycling programs as these are volatile and dangerous to collection workers. However, they are included in several hazardous waste drop-off programs in the GTA.

Current Aluminum Market Overview for Non-UBC Material

Aluminum is utilized extensively in the automotive industry (bumpers, transmissions, radiators, pistons etc.), electrical industry, transportation sector (tractor trailers, truck and bus paneling etc.), building products (siding, doors, windows, eavestrove etc.), aircraft industry (aircraft fuselage and parts), recreational uses (lawn chairs, barbecues, slides etc.) and the majority of roadsigns and supports.

The annual generation of other aluminum products in the GTA is difficult to specify for a number of reasons. First, most of the applications are durable goods that do not become waste for years to come. Second, the wide range of aluminum applications are as small components of larger manufactured items, for example, the average car has 66 kilograms of aluminum (Fuller, Wabash Alloy Ontario 1993).

The majority of scrap aluminum is generated in the IC&I sector, either as post industrial trim or, to a lesser extent, as post-use products. Only a small portion of aluminum scrap (approximately 2%) is generated in the residential sector (Lobel, House of Metals). Post industrial aluminum is generally sold to a dealer who may sort and bale the material for transport to the end market. The majority of post-consumer scrap is also sold through scrap dealers to brokers (in many cases by-passing developing municipal recovery programs). End markets smelt the material according to grade, and reprocess it as an alloy or as aluminum sheeting.

There are three primary markets for scrap aluminum collected in the GTA which include Wabush Alloys Ontario in Toronto, Federator Genco in Hamilton and Alcan Ingot Alloys in Guelph. These are aluminum smelters which produce aluminum ingots and molten aluminum for manufacturing applications such as the automotive sector. The Alcan plant representative reported that this facility is presently operating near capacity (Dalla Via, Alcan).

Wabush indicated that the majority of scrap aluminum recovered is sold to manufacturers within Ontario. However, some brokers now favour American markets because they pay higher prices for the material. A large portion (reported between 75% and 99%) of Ontario and GTA material is sold by some brokers to companies such as Reynolds, Alcan and Kayser, in the United States (Lobel, House of Metals and Lissack, Triple M). One large dealer revealed that for the first time this year, it will sell material to the US to avoid the onerous processing requirements of its previous Canadian end market.

Aluminum Prices

As a world commodity, the price for aluminum cans varies according to demand price and availability of primary aluminum on world markets. Primary aluminum is used for higher value applications and secondary aluminum cans are used for can sheet production. When demand for primary ingot declines and prices fall, aluminum can prices must fall as well to stay economically viable. Conversely, when primary ingot prices rise, can prices must rise to keep cans from being used in secondary smelters as a substitute for lower grade scrap aluminum such as siding.

In 1992, the price for aluminum cans varied from $770 to $1,100/tonne, and currently stand at $792/tonne. Over the past five years, the price for aluminum cans has risen as high as $1,750/tonne and dropped as low as $500/tonne (Shah, Alcan).

Aluminum foil prices paid by Alcan Recycling currently range between $330 and $396/tonne (Fuller, Wabash Alloy Ontario).

The value of aluminum scrap offered by metal dealers in and around the GTA varies depending upon the type of alloy as well as the quantity and quality of aluminum being purchased. Scrap is graded, with post consumer at the low end of value and post industrial at the high end. Prices reported range from a low of $640/tonne to a high of $1,210/tonne (Representatives of Canadian Smelters and Dealers). As a general rule, scrap aluminum prices are slightly lower than aluminum can prices.

Diversion Trends.

Reduce

Through research and development, the aluminum industry has reduced the weight of the aluminum beverage can by 13% since 1982. Aluminum is now commonly substituted for heavier materials such as steel in cars.

Reuse

There are currently no common reuse applications for aluminum products. Due to the wide diversity of applications for aluminum, reuse will apply only to certain selected items such as siding, window frames, doors and road signs.

Recycle

Alcan has committed to recycling every kilogram of aluminum cans that is recovered. The value of aluminum scrap will always ensure a strong demand for the material. Problems arise, however, if the aluminum can not be economically source separated or recovered from manufactured items such as electrical parts.

Quantities of Aluminum Diverted

Used Beverage Cans

Alcan Recycling acts as the processor for all aluminum beer cans collected through the Brewers' Retail. Approximately 80% of all aluminum cans handled by Alcan is from the Brewers' Retail. Alcan also receives the majority of aluminum cans collected through municipal curbside recycling programs, plus cans that are collected by social institutions (e.g. schools) or private companies (e.g. private recyclers).

The total quantity of aluminum cans recovered in Ontario in 1991 was 8,347 tonnes. Alcan recovered 7,589 tonnes while all other sources handled 758 tonnes (Confidential Client, 1992).

The provincial tax against aluminum beer cans has reduced beer can sales by 40% in Ontario. As a result, it is anticipated that recovery will have declined in 1992 and for the foreseeable future.

Other (non-can) Aluminum

Wabush reports its annual in-take of scrap aluminum at approximately 41,000 tonnes per year (Fuller, Wabash Alloy Ontario). Wabush collects scrap aluminum from selected generators such as McDonnell Douglas. Wabush also purchases aluminum from a network of scrap metal dealers, such as Triple M and Waxman Recycling, as well as several demolition firms.

Federated Genco purchases scrap aluminum from the GTA (and other areas) for melting and production of aluminum ingots. The volumes handled by Federated were not available from the company's representative.

Alcan, Guelph processes approximately 72,000 tonnes/month for the production of foundry alloys for items such as automotive casting. Aluminum foil is also melted into aluminum ingots at the Alcan facility in Guelph. This company was unable to estimate the percent of material that would be generated in the GTA.

Future Market Trends for Aluminum

Prices for aluminum are volatile, but are presently beginning to rise again after a brief slump. One broker reported a 25% increase in demand for scrap aluminum, while another reported operating at 50% capacity, with serious concern for the future. The key lies in providing high grade materials and operating in a healthy economy in general. For instance, since the scrap smelters in Ontario are closely tied with the automotive industry (Wabush indicated that 80% of aluminum produced by the company is sold to the automotive sector) the continued strength of secondary aluminum markets will be heavily dependent on this upstream market.

Aluminum is a highly valuable metal which is traded throughout world commodities markets. The inherent value of aluminum ensures that there will always be a strong demand for aluminum cans and other aluminum scrap products. End markets including aluminum can sheet manufacturers and secondary aluminum smelters will continue to exist.

Industrial and manufacturing applications for aluminum are extensive. Because of this, it is anticipated that aluminum will be used in more applications in the future for its light weight and non-corrosive properties.

Market Outlook for GTA Generated Aluminum

Given that several brokers are presently selling aluminum scrap to American processors in the U.S., it is predicted that there will be adequate capacity in local mills to service the GTA market for the forseeable future.

White Goods

Definition

White goods consist of metal household and industrial appliances such as refrigerators, freezers, sinks etc. They are often composed of a mix of materials and may require additional pre-processing prior to marketing to end-users.

Current White Goods Markets Overview

In the GTA, the white goods recycling industry is dominated by three companies including International Iron & Metal Inc. (Hamilton), I.Waxman & Sons (Hamilton), and Inland Iron & Metal (Georgina).

The shredding industry has a capacity to accept significantly more white goods than are currently in supply. Many municipalities in the GTA have introduced a ban on white goods which may increase the supply of scrap metal generated through recovered white goods.

The markets for white goods are seasonal. In the summer, the supply of white goods increases, whereas, in colder months (particularly this winter) supply is low.

Most residents in the GTA are provided with some form of curbside collection of white goods. For those households without curbside service, a drop-off service is available. Scrap metals are usually stored at landfills before they are taken to scrap dealers for shredding and recycling without salvaging parts or recovering CFCs or capacitors. The steel industry then incorporates the material back into steel products.

A network of several scrap dealers reuse and recycle GTA white goods. P&F Technologies, Brampton, and D.S. Fraser, Oakville are specialized private collectors and appliance trade-in centres that recover CFCs. Brampton, Etobicoke, Mississauga and Richmond Hill recover CFCs and/or compressor oil before sending the white goods to the scrap dealers. Other municipalities store white goods without processing until scrap dealers collect the material.

A major issue in white goods recycling is contamination. Scrap dealers prefer white goods that are free of CFCs or capacitors which may contaminate metal shredder fluff. The fluff is a by-product of the metal shredding process of recycling white goods (CH2M Hill, 1990). It is considered a valuable material in some regions in North America for use as landfill cover. However municipalities in the GTA find disposal of the material a problem. Some concerns have been raised about the potential presence of PCBs in some capacitors which are shredded along with the white goods.

White Goods Prices
The price paid for white goods varies. Some depots in the GTA will accept white goods dropped off. Most charge a tipping fee of as much as $150.00/ tonne in Halton for white goods with compressors (AMRC, 1993).

The shredding industry pays between $30-$50 per tonne (including collection) for white goods without compressors.

Diversion Trends

Reduction
The New Inorganic Materials Science (NIMS), was recently developed for use as a filler reducing the overall proportion of metallic materials in household appliances produced in 1989 (CH2M Hill, 1990). When these appliances enter the waste stream in years to come, the overall tonnages of white goods may decrease along with the metallic content.

Reuse
White goods are reused both formally and informally by various groups within the GTA. Exchange days or community garage sales in East York and Richmond Hill allow residents to reuse white goods, regardless of condition. Service organizations (eg. Goodwill and the Salvation Army) accept white goods in good condition for resale. Private salvage yards conduct reuse of white goods with a more organized system. Appliances with minor problems are repaired for resale and the others are stripped down for parts. The remaining scrap is then sent to a shredder for metal recycling.

Recycling
Within the GTA, Halton and York Regions and Metro Toronto have imposed landfill bans on white goods. Most municipalities in the GTA offer curbside collection with access to a drop-off service, while others provide access to drop-off facilities at depot sites.

The use of PCBs ceased in 1977 and over half the white goods with capacitors have been disposed (CH2M Hill, 1990). As a result white goods available for disposal and with the potential to contain PCBs will decline in the future. This will diminish concerns of metal shredders regarding recycling of white goods.

Quantities of White Goods Diverted
In 1990, an estimated 25% (22,000 tonnes) of white goods were processed by the Ontario shredders with the rest being landfilled, stockpiled or recycled using baling processes (CH2M Hill, 1990).

For municipalities in the GTA able to quantify this information (i.e. Halton Region, Brampton, Mississauga, East York, York, Etobicoke and Richmond

Hill) a reported 3,340 tonnes of white goods were diverted in 1992 (AMRC, 1993). Based on per capita diversion in Halton and Mississauga, approximately 4,660 tonnes would have been collected from the GTA in 1992.

Current and Future Market Trends for White Goods

In Ontario, about 95,000 tonnes of white goods are available for disposal each year (CH2M Hill, 1990). Of this material, 82% (77,000 tonnes) can be recovered as scrap ferrous metal, 4.6% non-ferrous metals, and the remainder includes glass, plastic, rubber, etc..

The capacity of Ontario's metal shredding industry was 900,000 tonnes in 1990, of which 10%-20% can be appliances and other scrap metal (CH2M Hill, 1990). Therefore, 90,000-180,000 tonnes of scrap metal capacity is available for processing appliances and other scrap metal.

Market Outlook for GTA Generated White Goods

Based on the above discussion, it is anticipated that recycling capacity will always be available for whatever white goods are generated and recovered in GTA.

Markets for Construction and Demolition Waste

Introduction

Four major industry sectors generate C&D wastes. These include the building construction, renovation, demolition and road construction industries. In the past, construction/demolition wastes were accepted in most landfills due to their relatively inert properties and suitable fill characteristics. One study estimated that C&D wastes are a major contributor to the overall volume of waste disposed in landfills, and contribute up to an estimated 25% by weight of the waste stream. Over the years, many landfill operators and environmental advocates have begun to recognize the inherent benefits associated with diverting C&D waste from landfills (Donovan, August 1991).

Other factors have contributed to the reduction in C&D wastes processed in Canadian cities, particularly the Greater Toronto Area, including:

- decrease in C&D activity due to poor economic conditions;
- significant increase in the volume of C&D wastes exported for landfill; and
- diversion of banned materials (i.e. wood, drywall, OCC, rubble, metals etc.) through the existing recycling infrastructure (MacViro, 1992).

C&D materials, particularly wood waste, drywall, metal, cardboard, and rubble offer good potential for recycling. Problems associated with recycling of

C&D wastes occur when hazardous contaminants are mixed in with the recycling stream. Hazardous contaminants include, but are not limited to, asbestos, pressure treated lumber, oil-based paint, and wood treated with creosote (Donovan Associates Inc., 1990).

Definition

The construction and demolition (C&D) waste stream is defined as all waste resulting from the construction, renovation and demolition of buildings, roads, bridges and all other structures. The construction waste stream is a mixture of materials including wood, drywall, metals, plastics, asphalt shingles, bricks and cardboard.

A study conducted for Metropolitan Toronto (Proctor and Redfern, and SENES 1991) examined waste generated by the construction and demolition sector. As shown in the Table H-9, wood waste constitutes over half of the waste stream in the construction/demolition sector with wood, aggregate, and building materials comprising the majority of waste stream in the renovation sector. Building materials include drywall, shingles, plaster, ceiling tile, electrical wire and insulation.

Table H-9
Estimated Composition of Construction, Demolition and Renovation Waste

Waste Materials	Construction (%)	Demolition (%)	Renovation (%)
Wood	31.4	51.8	28.0
Ferrous Metal	8.8	4.7	5.5
Non-Ferrous Metal	0.4	0.5	
Plastic	3.2	0.7	2.4
Glass	4.2		1.4
Paper	5.1	0.4	1.9
Paperboard	6.6	0.3	1.6
Building Materials	17.9	7.9	21.2
Aggregate	19.9	24.7	36.0
Textiles/Rubber/Leather	3.4	0.3	1.6
Fines		8.7	
Special			0.3

(Proctor and Redfern and SENES, 1991)

Not only do the types and proportions of waste materials vary among the construction, demolition, and renovation sectors, but the amount of waste also varies. The Toronto Home Builders' Association estimates that the quantity of waste generated from renovation activities surpasses the quantity

of waste generated by new construction activities by a factor of four. A newly constructed home generates an average of 2.5 tonnes of construction waste.

Generation of Construction and Demolition Wastes in the GTA

Due to the fact that a high degree of C&D materials have been historically recovered and recycled, it is difficult to determine an accurate estimate of C&D waste generation. Based on information provided from landfill records and waste composition studies, approximately 470,000 tonnes of C&D waste were landfilled in 1990 at GTA landfills, with 340,000 tonnes handled by Metro facilities. In 1992, Metro indicated that they handled only 108,000 tonnes of C&D waste, resulting in a 68% reduction in waste generation since 1990 (MacViro, 1992). Assuming other GTA municipalities experienced a similar decline in generation rates, the overall amount of C&D waste landfilled in the GTA landfills would have equaled approximately 150,000 tonnes in 1992.

A report prepared for the Ontario Ministry of the Environment and Energy studied C&D waste generation and flow in the province of Ontario as a precursor to an analysis of the constraints and opportunities facing the C&D industry to achieve greater diversion of the waste stream. Given the unusual circumstances facing Southern Ontario with regards to waste exports and the slow housing market, the study estimated waste generation under the assumption of future reductions in waste export and a more buoyant economy (MacViro, 1992). The following are some of the waste generation estimates included:

- gross GTA-wide C&D waste generation of 700,000 tonnes per year;
- historic source separation and diversion of concrete, metals and other heavy materials assumed to be 300,000 tonnes per year;
- of the 400,000 tonnes remaining:
  - — 100,000 tonnes of relatively clean source separated materials are estimated to be diverted at source and recycled (e.g. wood, drywall, OCC)
  - — 150,000 tonnes of commingled C&D materials are estimated to be available for processing at mixed C&D waste MRF. Of this total, an estimated 60% is recovered;
  - — the residual material from the MRF is landfilled, plus 150,000 tonnes which is directed to landfill initially for a total of 210,000 tonnes per year.

Construction, Demolition, and Renovation Industry Overview

The construction industry involves the developers, builders or general contractors and sub-contractors (trades) which construct residential, commercial and industrial buildings. The construction industry in the GTA is represented by the Toronto Construction Association and the Greater Toronto Home Builders' Association which estimates that between 5,000 and 10,000 contracting firms service the GTA. It is estimated that 60% to 70% of these firms are small with the number of employees ranging from 2 to 50 (MacViro, 1992). Unlike the construction and renovation industries, the demolition industry, servicing the GTA is dominated by a relative small number of firms. The GTA is serviced by 4 to 5 main demolition companies with an additional 25 to 30 smaller firms.

The C&D industry relies mostly on recycling activities, as opposed to reduction and reuse activities, to achieve diversion of their waste stream. To date, source reduction and reuse initiatives have not significantly contributed to overall waste diversion experienced within the industry (Toronto Construction News, Sept/Oct 1992). The majority of waste stream consists of drywall, wood, metal, cardboard, and rubble which can be effectively recycled into other products. Table H-10 highlights some typical waste materials found on a construction/demolition site and the opportunities for end use.

Table H-10
Typical C&D Waste Materials and Potential Uses

Waste Material	Market Value	End Use/Recycled Products
gypsum wallboard	low	new wallboard soil amendment
bricks and blocks	medium	roadbase/backfill decorative facades
wood - untreated	low	chipped for fuel, landscaping compost bulking animal bedding particle board manufactured building products
plastic	medium	chipped/shredded and used to make insulation
asphalt - shingles - road repair	low	paving material for roads and bridge resurfacing

(Source: Donovan Associates Inc. 1990 and CMHC, [n.d.])

The degree of separation of demolition wastes is dependent upon what the contract stipulates, the space available to source separate and the economics of recovering materials. At some projects, the buildings are basically stripped of recoverable metals, wood and brick/concrete. The residual materials (roofing, internal walls, windows etc.) are then disposed of as a mixed waste. Other projects call for the building to be demolished quickly with little opportunity to recover materials. In these situations, the waste rubble, wood, metals and other materials are completely mixed and therefore difficult to recover and divert from landfill.

Landfill bans have encouraged diversion of homogeneous wastes generated by the C&D sector; each of the GTA municipalities have imposed landfill disposal bans for wood, drywall and cardboard. As such, source separation of banned materials takes place at a number of construction sites. Over the years, C&D companies have achieved significant diversion of the quantity of waste going to landfill. Monarch Construction has achieved a 50% diversion of waste going to landfill through source separation and on-site reuse applications (Confidential source).

The renovation sector consists mostly of small to medium sized companies, with a large number of individual private contractors doing piece-meal work. The Greater Toronto Home Builders' Association estimates that approximately 10,000 licensed renovators operate in the GTA (MacViro, 1992). The number licensed renovators tends to fluctuate with the buoyancy of the economy and the level of activity in the housing market. Renovation combines both construction and demolition activities but to a lesser degree than the C&D industry.

According to the renovation industry, the cost associated with waste disposal from renovation activities accounts for almost 10% of the overall costs incurred during the renovation (Globe and Mail, April 10, 1992). There is increasing interest and opportunity for the renovation industry to engage in reuse and recycling activities; however, due to the small size of the operations, it is often difficult for renovators to secure markets for their recyclable wastes due to the relatively small amounts generated at a specific site. The cumulative effect of renovation activities, however, is significant.

The trend for processing recyclable C&D and renovation wastes is to commingle them at the source (with separation from the non-recyclable fraction) and separate the commingled stream at a processing facility. While source separation of individual materials requires less processing resources and equipment, it does not necessarily maximize overall recovery and recycling of the C&D waste stream. Commingled waste processing facilities increase the overall amount of waste diverted from the C&D waste stream, given that strict separation requirements are met by the client. In general, the commingled waste processing facilities will require only those designated C&D wastes to be combined in a separate collection container from the remaining waste stream. This policy allows the facility to process the commingled C&D wastes while ensuring that contamination levels remain low.

Due to the nature of the C&D industry, the opportunity for contamination by hazardous materials continues to be a concern for C&D processors. Hazardous/special waste materials that may inadvertently enter the recycling stream include asbestos, mercury from electrical switches, and PCBs in fluorescent light ballasts manufactured before 1980. Other undesirable contaminants include pressure treated wood, and wood treated with creosote.

There are currently 8 facilities located in the GTA that accept mixed (commingled) C&D wastes for processing. Each operation utilizes manual labour and light equipment (Bobcat with grapple) to separate recyclables from the mixed loads. Residual waste materials from these operations are transferred to landfills in the United States. Table H-11 identifies the companies and provides a description of the materials accepted.

Table H-11
C&D Waste Processing Facilities in GTA

Company	Capacity (tonnes per year)	Material Processed	Comments
Greater Toronto Area Harkow Aggregates & Recycling Toronto	150,000	wood metal OCC	tipping fee $97 per tonne 7-15% diversion
Canadian Eagle Recyclers/Greenspoon Demolition Markham	75,000	wood drywall metal OCC used carpet	
Queensway Recycling Etobicoke	not available	mixed office paper OCC wood drywall	tipping fee $110 per tonne
Teperman Demolition	not available	brick concrete wood metals	
Conwaste Inc. Brampton	not available	wood OCC	manual separation of materials
Delsan Demolition Ltd. Metro Toronto	75,000	wood metal brick concrete	
Hamilton Phillips Environmental	42,000	wood OCC metal asphalt concrete/brick	20% originates from the GTA asphalt, concrete and bricks must arrive source separated
Laidlaw Waste Systems	44,000	wood OCC drywall metals	12% diversion rate achieved

Sources : Lynch, Harkow Aggregates
: Mittleman, Canadian Eagle Recyclers
: Teperman, Teperman Demolition
: Campbell, Conwaste Inc.
: Tancredi, Delsan Demolition Ltd.
: Graham, Philips Environmental
: Allison, Laidlaw Waste Systems

In addition, there are four facilities operating in Ontario that accept clean drywall, and limited drywall from demolition projects. These facilities are:

- CGC - capacity of 500 tonnes per year, accepts only clean drywall
- Domtar - capacity of 3,600 to 4,800 tonnes per year, accepts only clean drywall
- New West Gypsum/Westroc - capacity of 26,000 tonnes per year, accepts clean drywall and some drywall from demolition projects
- Terra Care - capacity of 2,000 to 3,000 tonnes per year, uses the material in the production of cat litter.

Sources: : McCamley, New West Gypsom
: Webber, CGC
: Marty, Tema Care

According to an industry representative, Ira Greenspoon of Canadian Eagle Recyclers, it is critical to maintain a clean supply of C&D waste with low levels on contaminants in order to ensure a healthy market. Furthermore, recycling must remain affordable for the C&D industry to keep separating the materials at the source and to keep the materials in Ontario (Toronto Construction News, Sept/Oct 1992).

The Road Construction Industry Overview

The majority of road construction activity is tendered by the Ontario Ministry of Transportation or municipal public works departments. Road construction contractors are represented by the Ontario Hot Mix Producers' Association and the Ontario Road Builders' Association. Road construction and repair wastes are easily separated without contamination. Separate asphalt, concrete and metal wastes are easily segregated and sent to paving companies for reclamation as Reclaimed Asphalt Pavement (RAP) (MacViro, 1992).

The use of Reclaimed Asphalt Pavement is established in the GTA. An estimated 50% of the old asphalt is currently reused. In 1990, it was reported that province-wide 1,222,000 tonnes of old asphalt was reused as hot-mix while a further 1,493,000 tonnes was stockpiled (MacViro, 1992).

A total of 400,000 tonnes of asphalt processing capacity was identified with the GTA through a survey of recycling facilities conducted in 1992. The survey found that capacity could be expanded with multi-shift operations and that there appears to be sufficient capacity to process asphalt generated within the GTA (MacViro, 1992). The asphalt processing operations include companies such as Ambro Materials & Construction, D. Crupi & Sons, Fermar Asphalt Ltd., Maple Paving, Miller Paving and Warren Bitulithic Paving.

While processing capacity is available for asphalt, major barriers to recycling this material currently exist and large quantities are being stockpiled. The Ontario Ministry of Transportation and municipalities have raised concerns regarding the durability of paved surfaces containing RAP. RAP can represent up to 25% of the material used in road base (HL8) material, but cannot be used in top layer pavement (HL3) (Sizer, City of Brampton).

Aggregate Wastes

The management of aggregate (i.e., concrete, brick), as well as asphalt materials varies in handling and processing from other C&D wastes. Aggregate and asphalt wastes traditionally have been source separated from mixed wastes and recovered. Concrete, concrete blocks and bricks are commonly reused as backfill material or sub-base material on the construction job sites (THBA, 1990). Alternative uses in the GTA include lakefill applications and as an aggregate substitute in road base construction.

The use of concrete rubble in lakefill applications is a significant landfill diversion practice within the GTA. Both the Toronto Harbor Commission (THC) and the Metropolitan Toronto and Region Conservation Authority (MTRCA) use earth fill, small and large concrete pieces for erosion control and development of lakeside parks and marinas. In the three years from 1990 to 1992, the THC and MTRCA has used an average of 619,000 tonnes per year of used concrete material as lakefill. Lakefill applications are anticipated to be reduced significantly as some THC and MTRCA projects are nearing completion (Cowey, Metropolitan Toronto and Region Conservation Authority).

Prices

In the past, prices charged for processing mixed C&D wastes have remained competitive with GTA landfill tipping fees. Prices range from approximately $97 to $110 per tonne for mixed loads of C&D waste arriving at the processing facilities. These prices also are comparable with the prices charged by private waste hauling companies shipping wastes to the United States; hauling charges, including tipping fee, average $80 to $100. Recent changes to the tipping fee prices charged at Metropolitan Toronto landfills (reduced to $80 and $90 tonne) may impact the C&D recycling industry.

All drywall processing facilities charge a fee to process used drywall, with the exception of Domtar which has an agreement with its hauler to share both costs and revenues from recycled drywall. Fees range from a low of $35/tonne at Terra Care, to a high of $60-70/tonne at CGC, with New West at $65/tonne (See Table H-11 for sources).

Trends in C&D Waste Diversion

Very few developments in the handling and diversion of C&D wastes have taken place in the GTA and none are anticipated for the near future. This is primarily due to the overall lowering of tipping fees that have resulted from the influx of transfer station operations to transport wastes to the United States. Communications with recycling operators indicate that current tipping fees coupled with a volatile marketplace have hindered decisions to invest in new processing equipment or expansion plans to process C&D wastes.

Legislation and Policies

Several recent policy and legislative initiatives have been introduced with the intention of further promoting source reduction, reuse, recycling and market development of the C&D waste stream.

In April 1992, Bill 143 received royal assent and became the Waste Management Act, setting the foundation for the Ontario Ministry of the Environment and Energy (MOEE) to proceed with legislation that will require construction and demolition companies operating at sites equal to or greater than 2,000 square metres in total floor area to source separate the following materials: wood, steel, concrete, brick (both) and drywall and OCC (construction only) (MOEE, Draft 3Rs Regulations).

Currently, all Ontario government construction and renovation projects require that the contractors sort recyclable debris from non-recyclable debris and promote reuse of construction materials when applicable. The document outlining these waste minimization strategies, entitled *Environmentally Conscious Design for Ontario Government Buildings,* provides direction for ensuring that waste reduction and recycling systems are built into the architectural designs and that waste diversion activities are actively pursued during construction and renovation.

In January 1993, the Ontario Construction Industry announced its *3Rs Code of Practice* which outlines principles and initiatives for businesses to adopt to reduce waste sent to landfills.

Increasingly, the construction and renovation industry is recognizing that opportunities exist to incorporate recycled content building materials into the construction and renovation of buildings. In 1991, the Greater Toronto Homebuilders' Association in association with ORTECH International constructed a "Green Dream Home" showcasing recycled content construction materials and internal furnishings. Increased awareness of recycled content building products will help to rejuvenate the end use market and create new demand for recycled materials (ORTECH, [n.d.]).

Reduce and Reuse
Source reduction at the construction site is still a new concept that remains in the early stages of development. According the Toronto Home Builders' Association, however, there is good opportunity to reduce the amount of waste generated on a construction site. The Association found that 10 percent of all dimensional lumber used during construction of residential dwellings is wasted (THBA, 1990). In fact, during the construction of an average sized home, over 2.5 tonnes of new construction waste is generated (ORTECH, [n.d.]).

Reuse, on the other hand, has attracted much attention, particularly within the demolition and renovation industries. It is estimated that the amount of reusable materials generated from renovation and demolition projects is ten times that of recyclable materials generated from new construction. In response, a number of companies have been established as clearinghouses for reusable C&D materials. Materials such as windows, fixtures, lighting, and shelving, which traditionally have been treated as waste items during renovation and commercial leasehold improvement projects, can now be sent to reuse centres for resale.

Two companies have been operating in Canada since 1989, The Reuze Centre in Toronto, Ontario and Envirocycle Expediting in Edmonton, Alberta. These companies not only sell reusable demolition materials at their facility but they offer pre-renovation audits to target and remove interior and exterior materials prior to renovation or demolition. In three years of operation, from 1989 to 1992, the Envirocycle Expediting centre diverted over 3,000 tonnes of reusable building materials worth $1.5 million at current retail replacement costs (Gerrand, 1992). Data from the Reuze Centre's 1992 annual report will be available for a later draft of this report.

Recycle
The greatest opportunities for overall waste diversion remain in the area of recycling. While many of the recycling and end-use processes continue to be as they were in the mid to late 1980s, some new opportunities for C&D recycling are currently being developed.

Contractors/drywallers are becoming more creative in attempting to dispose of off-cuts on-site, by saving pieces which would have once gone to disposal (e.g., large pieces from doors and windows, etc.). Also, some off-cuts are built in to interior wall cavities, not placed into dumpsters for disposal. A farmer in the State of Michigan is experimenting with the use of old wallboard as a lime substitute and soil conditioner. The gypsum wallboard is ground to a powder-like substance and then applied to the corn field.

The City of Brampton is conducting a test using a paving asphalt comprised of granulated discarded roofing shingles. The Granulated Bituminous Shingle Material (GBSM) is added to hot mix asphalt and was laid last September 1992. The GBSM is produced by IKO Industries and is comprised on waste shingles which are shredded and the nails are removed (Sizer, City of Brampton).

Technology has been developed to permit on-site recycling of pavement by heating, stripping, and mixing the asphalt in one continuous operation. The process can rejuvenate a road surface to its original state with the need to add nominal amounts of new aggregate and oil. Transportation of new and old materials from the site is thus eliminated.

Environment Canada are currently developing a research and development plan to address remaining technical barriers to increased C&D recycling in Canada.

Market Outlook for C&D Materials

Based on the above discussion, it appears that the private sector is willing to construct additional facilities in GTA to divert C&D wastes, but will not do so as long as export to the US is a more economical alternative for C&D waste generators.

Finding constructive uses for all processed C&D materials depends to an extent on MOEE guidelines for beneficial uses such as lakefill, backfill, etc. These are currently being studied by the materials utilization team at MOEE, and policies are expected in the near future.

Markets for Other Materials

Markets for Glass

Introduction

The glass industry is dominated by one primary market for colour separated glass cullet which is Consumers Glass in Etobicoke. The primary end use for colour separated glass cullet is to remanufacture the glass into bottles and jars. Manufacturers of glass containers require stringent separation processes for glass of different colours. Currently, glass must be separated at the source into flint, green, and brown glass to ensure product quality in the glass manufacturing process. Due to the stringent specifications, effort has been spent to identify and develop alternative end-use markets for mixed glass cullet, including aggregate substitute, sand substitute for sandblasting, manufacture of fibreglass, manufacture of glass tiles, and the use of glass in asphalt.

Definition

The glass industry is commonly separated into three segments: container glass (i.e. bottles and jars), flat glass (e.g. window glass), and pressed or blown glass (i.e. stained glass, glassware, etc.).

Specifications for glass as secondary feedstock vary considerably among the manufacturing applications. Contaminants must be removed and the glass crushed to meet a range of specifications in terms of cleanliness (the absence of contaminants such as bottle caps, labels and other non-glass materials) and coarseness (ranging from a fine powder to coarse glass chunks).

Three colours of glass are commonly produced into bottles and jars. These are:

- Flint glass commonly referred to as clear glass
- Light blue glass which is also called green glass
- Amber glass which is also called brown glass

Contamination must be kept to a minimum, with acceptable levels of colour contamination not exceeding an average of 5%.

The Generation of Recyclable Glass in the GTA

The main sources of scrap glass are post-consumer glass (i.e. from residential and IC&I locations) and pre-consumer glass (i.e. from production processes). Over the years, the volume of post-consumer glass available on the market has increased substantially as more communities and IC&I sectors implement recycling programs.

Despite the effort to collect glass through the recycling programs, to date, the type of glass accepted in these programs has been restricted to glass containers. Other glass products, such as windows, mirrors, lightbulbs, and ornaments still remain in the waste stream. These materials cannot be easily incorporated into the end-use container manufacturing market due to the incompatible properties of the secondary feedstock.

Table H-11 shows the quantities of container glass recycled in Ontario from 1989 to 1992 (Paradiso, Consumers Glass).

Table H-11
Quantities of Glass Recycled in Ontario 1989 to 1992 (tons)

Source	1989 (tons)	1990 (tons)	1991 (tons)	1992 (tons)
Ont. Blue Box programs.	34,146	63,441	85,504	89,447
IC & I (captive depot)	6,392	2,617	3,729	5,620
Consumers Glass Customers	15,181	15,925	21,633	37,215
U.S. (1)	9,290	2,898	365	---
Quebec (1)	4,803	5,816	289	---
Manitoba (1)	---	---	212	60
TOTAL	**69,812**	**90,697**	**111,732**	**132,342**

Note: all weights are provided in imperial tons (2,000 lbs/ton)

(References: U.S., Quebec, and Manitoba sources provide commercial cullet (not curbside or residential).

Consumers Glass estimates that 324,500 tons of glass cullet is available in Ontario, of which 80% is residential, and 20% IC&I (Paradiso, Consumers Glass).

Glass Recycling Industry Overview
To date, the majority of glass recovered in recycling programs is sent to Consumers Glass for manufacturing into recycled content glass bottles and containers. Despite the prominence of Consumers Glass in the glass recycling industry in Ontario, Consumers Glass has stated that there is a limit to the amount of cullet which they can handle, but also note that they have projections for increasingly adjusting capacity to handle increasing quantities of recycled glass.

Consumers Glass requires glass containers to be sorted into two separate streams from the residential sector:

- clear (may contain up to 5% light blue glass);
- coloured (may contain up to 5% light blue glass and 5% flint; should not contain more than 5% amber) (Paradiso, Consumers Glass).

Most of the amber coloured glass is collected through the deposit system applied to beer bottles sold in Ontario. In the past contamination by colour and other materials has posed a problems for the glass manufacturing sector; however, the current acceptance rate for loads of recycled glass is 99.3%.

Other companies in the IC&I sector must sort glass according to each colour category (clear, light blue/green, amber/brown). This situation is presenting difficult problems for large generators of recyclable glass, such as bottling companies, which must accommodate the additional storage space requirements to separate the three colours of glass. Smaller companies generally employ recycling firms that will separate the commingled glass collected from the recycling program.

Other end-uses for the glass cullet are being explored and developed as viable end-use markets. For example, the Ontario Ministry of Transportation acknowledges that 5-10% crushed cullet can be used in granular 'B' subbase (crushed to 3/4") (Kennepohl, OMT). At this rate, the demand for recycled glass cullet could reach up to 1,300 tons of crushed glass per mile of resurfaced road (Paradiso, Consumers Glass). To date, recycled glass has been used as an aggregate substitute by the following municipalities:

- Metro Toronto: 5,000 tonnes/year
- Region of Durham: 4,071 tonnes (all of the glass collected in 1992)

Glass is also being used as an abrasive for cleaning or preparing surfaces for painting or treatment, replacing the chemicals and sand traditionally used for these purposes. Scrap container glass ground as a fine abrasive have proven just as effective with fewer problems for worker health.

Prices

The amount of glass cullet purchased is conditional upon sales. Consumers Glass has experienced a loss of customers to American and Mexican glass producers. The range of prices paid for glass cullet over the past 3-4 years, by Consumers Glass is shown in Table H-12.

Table H-12
Prices Paid for Recycled Glass 1989-1992
$/ton (2,000 lbs)

	1989	1990	1991	1992
Flint (clear)	$60-75 **	75-60	60	43
Coloured (green)	$60-75	75-60	60	38
Mixed	$40	15-10	10	not accepted

** a $15/ton premium was paid between Oct./'89 - Mar./'90 to encourage colour sorting.

(Paradiso, Consumers Glass)

The prices paid for contaminant-free, colour sorted glass, are equivalent to the cost of using virgin materials for the production of glass containers. The higher prices paid prior to January 1, 1992 were to assist the development of the recycling infrastructure.

The current pricing of $43/ton for flint and $38/ton for green (coloured) will continue to be paid until further notice. Consumers will provide a written 30 day notice to all recyclers prior to any price changes (Paradiso, Consumers Glass).

Trends in Waste Diversion

Reduce

Over the past several years, many bottle and container manufacturing companies have redesigned the walls of the bottles and containers to reduce their weight and thickness. Added strength is achieved by using polystyrene wrap labels that fully encompass the side of the bottle.

Consumers Glass reports that they continuously review the design of their glass containers in order to "right weight" them to use as little glass as possible, while still meeting their customers' requirements.

Consumers Glass plans to reduce the weight of all glass container products 10% on average between 1988 and the year 2000 (Paradiso, Consumers Glass).

Reuse

Refillable glass containers have been used over the decades for numerous beverage products, including beer, carbonated drinks, and, to a lesser extent, milk. Due to the additional weight of the refillable bottle (approximately 3 times that of a non-refillable bottle) and the additional burden of

transportation, the popularity of this reuse approach has decreased over the years. In addition, life cycle analysis studies have not to come to a consensus about the environmental and energy advantages and disadvantages associated with refillable and non-refillable glass bottles.

Recycle

As the end-use markets develop, more glass manufactures have begun to increase the amount of recycled content in their glass bottles and containers. For example, the average recycled content of glass containers manufactured by Consumers Glass over a five year period from 1988 to 1993 has increased over four times. The increases in the recycled content is presented in Table H-13 (Paradiso, Consumers Glass).

Table H-13
Recycled Content of Glass Containers
Manufactured by Consumers Glass, 1988 to 1993

Year	Recycled Content	Tons of Recycled Glass Used	% Annual Increase (Ontario Blue Box Program)
1988	7%	20,230	---
1989	13%	40,538	100%
1990	23%	68,058	63%
1991	29%	89,233	35%
1992	32%	95,067	6%
1993 (planned)	35%	100,000	5%

Other potential end-use markets for glass, particularly the aggregate industry, are not as securely established as the glass container manufacturing industry. The use of crushed glass as an aggregate substitute in Ontario will not provide a secure market until a decision is reached about its use and the specifications required. The province of Ontario has not developed specifications governing the use of glass as an aggregate substitute in Ontario. While the Region of Durham is currently experiencing no problems with this use, this is presently a concern for Metro Toronto (Crowley, Durham Region, and Pollack, Metro Toronto).

Other end-use markets being developed include the use of recycled glass cullet in the manufacturing of fibreglass. Some existing manufacturers have been successful in using container and plate cullet in the production of glass fibre insulation. This option has become popular in the Western Provinces; for example, the province of Alberta uses over 10,000 tons/year of glass in the production of fibreglass.

The use of glass in the production of asphalt offers a potential long-term market for recycled mixed glass. The process of "glassphalt" involves using processed glass as an aggregate substitute for stone or sand in the surface layer of roadways. The process has the potential to consume 60 tonnes of cullet per lane-mile of road construction. Material contamination poses few problems in this process although there is a slight tendency for reduced traction at speeds over 80 km/hr.

In addition, geotextile sleeves filled with crushed glass can be used to replace perforated plastic pipe for various drainage applications such as road underdrain, building foundations, and parking lots. The feedstock is mixed cullet, including container cullet, plate glass and ceramics. The sleeves can also be used to control erosion and have the advantage of being reusable.

Post-consumer glass also can be pressed or blown into new glass products (other than containers) such as tiles, figurines, bowls, and other glassware. Glass reprocessing of this nature is generally considered a form of specialty production that provides local market opportunities, but does not represent an outlet for large quantities of waste glass.

Elsewhere, research is being undertaken to identify recycling opportunities for light bulbs and other glass lighting products. The Canadian Electrical Association has embarked on a project to identify end-use markets and collection opportunities throughout Canada.

Market Outlook for Glass

Glass collection has become a well established part of most recycling programs. However, handling and sorting of glass is problematic at MRFs, and colour sorting places on additional burden on MRF resources.

For these reasons, a number of alternative uses for glass are being explored at this time. Use of glass as an aggregate substitute holds significant potential. The benefit of such uses include a reduction in transportation of glass to Consumers Glass (the only significant market in Ontario) and reduced sorting and handling requirements to remove minor amounts of contamination.

Markets for Textiles

Introduction

Markets for used textiles are beginning to expand, and are likely to continue to grow over the next several years. Demand significantly outweighs supply. Although textile reuse (for personal and industrial applications) has long been practiced in some sectors, regular residential collection of the material is still in an early stage of development. Recent data from the Regional Municipality of Ottawa-Carleton's waste composition study indicates that up to 3% (3,200 tonnes) of disposed waste in the city still consists of used clothing,

textiles and leather goods (McGregor, Ottawa-Carleton), a finding which corresponds with a study by Franklin Associates (US) that reports textiles as 4.9% of the disposed wastestream. While not a huge portion of the waste stream, it is significant. Waste reduction through diversion of textile waste is expected to expand with the continued growth and development of existing markets.

Definition

In this report, textile is defined as used (or post consumer) clothing and household textiles (sheets, drapes, etc.). It usually does not include vinyls, plastics, leathers, belts, raincoats, luggage, ski gloves, handbags or shoes.

Traditional Textile Market Overview

There are three major markets for used textiles. These include Clothing, Fibre Markets and Industrial Wiping Cloth markets. These three markets provide a focus for this section of the report.

Clothing is the largest single use of textiles. Old clothes are sold for domestic and exported markets. Most processors sell a large portion of their output to Third World export markets because of the prohibitively high costs of new clothing in many countries (Haiti, India, Japan, Kenya, Pakistan, Senegal).

End uses of textiles sold as industrial fibre are diverse. One grade of textile (cotton rag stock) is sold to manufacturers of rag bond paper. Some wool garments are sold to manufacturers and rewoven into new garments. Other textile grades are used to pad upholstery and car interiors. Items such as cotton swabs, mops, gauze and mattress pads also often contain recycled fibres. The majority of material sold to fibre markets is exported.

The market for Industrial Wiping Cloth is almost exclusively domestic. Several used textile grades are trimmed and cut for sale to industries for cleaning machinery or spills, and for intermediate or final polishing of products before shipment. Concerns over the cost and environmental impact of virgin wiping cloth products have favoured recycled alternatives in recent years.

Current Textile Market Overview

Waste composition data from the Centre & South Hastings program indicates that approximately 15 kg of textiles/hh/yr are available for recycling (Argue, CSH) while only about 10% of this is presently being captured in the program.

Both domestic and export markets for used textiles are strong at present. As a result of the high cost of new clothing and virgin fibres, domestic demand for used textiles has increased over the past 10 years. (Resource Recycling February 1992) In the U.S., the textile processing industry sees a shortage of supply as a major problem. A 1991 report in New York City surveyed 35

textile recyclers and found that all had additional capacity (of up to 30%). (Resource Recycling February 1992).

The City of Mississauga is the only GTA municipality currently involved in curbside collection of textiles. A key requirement is that materials must be free of moisture. This demands greater effort and care on the part or residents, in order to make the program successful. Materials collected are separated at the Mississauga MRF and donated to Goodwill for retail sale, and for sale to salvage dealers as fiber.

Two other Ontario communities are presently collecting textiles at curbside. These include the City of Ottawa and Centre and South Hastings. A Centre and South Hastings study has shown that materials collected are marketed primarily for their highest use, as clothing for export to the Third World (84%). Other textiles are sold as shredded material for mattresses (13%), industrial wipes (2%) and reusable clothing (1%).

Other GTA textiles diversion programs include:

- The Regions of Metro Toronto and Durham have each sponsored the acquisition, refurbishing and placement of staffed collection trailers for Goodwill. The Region of Durham gave Goodwill a capital grant, helped them to locate their trailers, and promoted Goodwill in their public education efforts. While not operating a collection program, the Region was able to divert 1,223 tonnes of material (textiles in addition to other materials), collected from 3 Goodwill drop off sites in Whitby in 1991;

- diversion through the Salvation Army where materials are baled and warehoused prior to shipment to Metro markets;

- textile collection through an igloo depot system in the City of Brampton;

- door-to-door collection by private entrepreneurs, where used clothing is collected and sold to second hand clothing stores or salvagers.

Quality standards for textiles are becoming more stringent. For successful waste diversion, end users have established several specifications that must be met, as defined by the intended market. These include:

- textiles must be undamaged e.g. (not dirty or mildway);
- material must be trimmed (e.g. with buttons and zippers removed, etc.);

- textiles must be sorted (there are as many as 150 recognized grades of textiles);
- materials must be baled although some end markets will accept textiles in gaylords, or wrapped in plastic film;
- textiles intended for fibre markets may have to be processed through a tearing machine to prepare them for markets;
- minimum load requirements must be met.

Textile Prices

Prices reported to be paid for used textiles (in the three applications) throughout Ontario are relatively consistent. The majority of revenues reported to be received are in the range of $180/tonne.

Diversion Trends

The following programs highlight the trends in textile diversion that have been undertaken in communities across Ontario:

- in 1992, Goodwill diverted about 10,000 tonnes of material (not just textiles) from GTA landfills through 10 Attended Donation Centres (trailers) and 20 stores (Thompson, Goodwill Industries)

- the Ottawa program expects to divert 600 tonnes/yr from landfill (McGregor, Ottawa-Carleton)

- the Centre & South Hastings program captures about 12 tonnes/month (this is equivalent to approximately 1.7 kg/hh/yr, or about 11% of what's available) (Argue, CSH)

- Mississauga currently ships one 5 ton truckload every week or two to Goodwill Industries (Rathbone, Laidlaw Waste Systems)

- the City of Brampton collected 3.2 tonnes of textiles in 1992 through their igloo depot system (Stewart, Brampton).

Consistent with other programs that reuse textiles, Goodwill Industries report that they could handle significantly more material. It should however be noted that similar to leaf and yard waste, textile recycling is proving to be a seasonal activity. Demand is not steady, rather, the bulk of textiles are collected in spring and fall when homeowners dispose of clothes and rags as a by-product of house-cleaning projects.(BioCycle, February 1992)

Future Market Trends for Textiles

Reduction

Despite efforts to promote source reduction, to date, little focus has been applied to textiles. Public education could well be directed toward extending

the life of textiles, encouraging individuals to buy fewer, better quality garments which will last longer.

Reuse

Community agencies like Goodwill offer not only waste reduction benefits, but other community benefits such as work training programs, that can help people gain employment. There is a trend toward increased co-operation between these types of groups for ensuring full use of these products. Relationships between municipalities and community agencies can be very effective and efficient vehicles for diverting waste. For example, it has been suggested that periodic donation of municipal collection resources to assist these organizations would further promote development of reuse opportunities. Municipal sponsorship of reuse/charitable organizations will ensure continued growth of opportunities for reuse (i.e. through sponsorship or assistance with vehicles for charitable organizations).

Recycling

Centre and South Hastings operates its textile diversion program as an employment project for severely disadvantaged workers. This is a successful model that would lend itself well to the labour intensive nature of the preliminary processing involved in textile recycling.

To maximize recycling of textiles for the GTA, private recycling firms may require encouragement to locate in the Greater Toronto Area. Industry expert Ed Stubin manages a textile recycling plant in New York. He maintains that an economically viable operation must have integration of all three functions, since customers buy by the trailer load. This type of diversified operation would be probably be a viable venture for the GTA. Half of the textiles in his operation are sent overseas, the rest of the material is split between fiber uses and wiping cloths. His New York facility handles 12 million lbs/yr (approximately 5,400 tonnes/yr).

Market Outlook for GTA Generated Textiles

The required infrastructure for reuse and recycling of textiles, both post-industrial and post-consumer, is available to absorb the amount of textile waste currently generated in the GTA. Textile diversion requires care and attention on the part of residents. However, ongoing projects in Mississauga, Centre and South Hastings and Ottawa show that this need not be a barrier to increased waste diversion. Assuming maintenance of steady demand for fibres and wiping cloths, and increased demand for used clothing, the market should continue to grow. An improved collection system and fully developed infrastructure should ensure that textiles markets will remain strong and make textile diversion a viable element of the GTA 3Rs waste diversion system.

Markets for Wood Waste

Wood waste is generated in many different forms and from many different sources. Wood waste is a not a homogeneous waste material and is found in a wide variety of forms, including:

- Broken and whole pallets;
- Crates and boxes;
- Construction and demolition wood (e.g. flooring, dimensional lumber, end-cuts, roof supports);
- Wood chips, shavings and sawdust from manufacturing processes (e.g. furniture, window, door manufacturers);
- Manufactured wood (e.g. desks, doors, paneling etc.);
- Wood scraps and end-cuts;
- Tree stumps and brush; and,
- Miscellaneous forms such as cable spools, telephone poles, railway ties.

Current Markets for Wood

There are a wide range of uses for wood waste. Most end markets require that the wood be reduced to a consistent size such as wood chip, shaving or sawdust. Current end uses found for GTA generated wood wastes include:

- Secondary wood manufacturing;
- Energy recovery;
- Production of fire logs;
- Livestock bedding;
- Mulch and compost; and,
- Recreational/landscaping uses.

There are approximately 20 operators in the GTA who will process wood wastes into more usable forms. The process operations range from large facilities with multiple shredders, screening and magnetic separation to more simplified operations that utilize mobile tub grinders and screening equipment. There are approximately 30 companies that collect, repair and sell used wood pallets. A number of the larger pallet refurbishers also grind residual wood wastes.

There are approximately 5 companies that provide containers and collect higher value wood wastes such as sawdust and shavings from wood working manufacturers.

Approximately 10 direct end markets are active in handling wood wastes from the GTA. There are also an unknown number of farmers who utilize wood chips and shavings for livestock bedding. The majority of this material

is collected by the farmers directly from wood waste generators such as furniture manufacturers.

Wood Specifications

Each end market application requires different material specifications. The specifications can call for particular sizing, wood type, moisture content and usually require material to be contaminant free (e.g. metals, chemical residue, grit and stones).

The Domtar particle board operation requires hammer milled hardwood, free of metals and grit, whereas the Northern Globe roofing felt facility requires softwood chips or shavings.

The Ajax Energy facility requires the wood be free of contaminants such as plastics and food waste, but can accept nails in pallets and boxes. Fire log manufacturers tend to have much tighter specifications including type of wood, contamination levels and moisture content.

Applications where the wood will be used as mulch/compost or for landscaping also have strict specifications for contaminant free material including chemical residue and metals.

Quantities of Wood Diverted

Based on estimates provided by the end markets contacted, an estimated 94,000 tonnes of wood waste are being recycled from the GTA through secondary wood manufacturing and energy recovery applications. An unknown quantity of wood waste is utilized as livestock bedding and landscaping applications.

A high degree of pallet reuse takes place in the GTA. There are approximately 30 pallet reconditioners in the GTA that repair wood pallets for resale.

Current and Future End Uses of Wood

There are three end markets which utilize wood waste from the GTA as a feed stock in a manufacturing process. The largest operation is IKO Industries in Brampton. IKO utilizes wood chips in the manufacture of roofing felt for the building industry. IKO has the ability to receive 30,000 tonnes of wood chips annually, however, they are having difficulties in securing suppliers (Warner, IKO Industries).

Northern Globe (formerly Domtar) is a another manufacturer, located in Thorold, which uses wood chips, together with corrugated cardboard in the production of roofing felt. The facility handles about 13,500 tonnes of wood chips per year (Palento, Northern Globe).

Domtar operates a particle board manufacturing facility in Huntsville. Domtar sources secondary wood waste from two suppliers in the GTA and has a current capacity of 11,000 tonnes per year (West, Domtar Particle Board). Combiboard in Bancroft, which was producing a manufactured particle board went out of business in 1991.

Can-Fibre has plans to utilize wood waste in the manufacture of a medium density fibreboard. The facility will handle between an estimated 91,000 and 118,000 tonnes of waste wood and boxboard. The process will use a blend of wood waste and boxboard with the goal by 1998 to have a 50/50 blend of materials. The facility is planned for the Halton area (Kyle, Can-Fibre).

Utilizing wood waste as an energy source or for the production of fuel pellets or fire-logs is the second type of end market for GTA wood wastes. Ajax Energy Corporation burns wood wastes to produce steam for sale to local businesses. Ajax utilizes approximately 30,000 tonnes per year of wood waste (Saab, Ajax Energy Corp.).

Some manufacturers also use wood wastes that are generated for internal heating requirements. Fire log manufacturers such as Bauman Woodfuel (2,500 tonnes per year) (Bauman, Bauman Woodfuels), Conros Corporation (20,000 tonnes per year) (Dias, Conros Corporation) and Monto Industries (2,000 tonnes per year) (Ferrier, Monto Industries) use wood waste in the production of fire logs for retail sale. Fire log production is seasonal in nature, with most activity between June and September.

Wood wastes are also used extensively by the farming community as livestock bedding. This end market outlet varies seasonally and the farmers tend to work out agreements with local wood waste generators. The farmers that require the wood waste for livestock bedding tend to be located within or just outside of the GTA. RT Recycling in Stoney Creek produces a bagged sawdust like material for agricultural uses. RT consumes an estimated 5,000 tonnes per year (Kahne, RT Recycling).

Some wood wastes are used in mulch or composting applications. Miller Waste Systems of Markham accepts clean loads of wood waste at their facility in Markham. The wood is stockpiled and a grinder is rented on a quarterly basis to produce a wood chip that is used at the Region of York's yard waste composting facility which is operated by Miller (Verhoff, Miller Waste Systems). White Rose Nurseries composts lumber mill wastes at their operations in Uxbridge. They use wood waste generated from outside the GTA due to limitations of local suppliers in providing a clean, consistent material.

Recreational applications of wood waste include use on walking trails and in parks by local and provincial governments and Conservation Authorities, while operations utilize wood chips in garden and landscaping applications.

Metro Toronto Works Department will be issuing a request for proposals to collect wood wastes at Metro transfer stations. Metro has had discussions with two companies that have plans to use wood waste. Molded Strandboard is planning to use wood waste in the production of a molded pallet (Innes, Metropolitan Toronto Works Department).

On-Site Energy is a 20 mega-watt wood burning facility located in Chataqua, New York. The facility has the capacity to handle 91,000 tonnes per year and currently sources material from lumber mills and manufacturing operations in New York City, Montreal and Cornwall. On-Site has been actively trying to secure a supplier from the GTA for over two years. They are willing to accept an estimated 18,000 to 23,000 tonnes/year from GTA suppliers. The 315 mile distance and the $9 – $10 per tonne offered for the wood appears to be the prohibitive factors in securing contracts with GTA supplier (Dowd, On-Site Energy).

Supply and Demand of Wood

Based on the discussions with the wood waste end markets and wood waste processors, the most limiting factor currently is the diversion of wood waste through illegal operations and transfer of waste to landfill disposal in the United States.

Demand for clean wood waste material appears to be strong. For example, IKO Industries expanded their felt mill capacity to handle more wood waste material, and now cannot locate sufficient quantities of suitable wood waste. RT Recycling and Conros also expressed some problems in getting suitable material on a consistent basis.

Wood Prices

The prices for disposing of wood waste with a processor or end user vary throughout the GTA. Farmers, for example will arrange to have the wood waste collected from a generator at no or nominal costs to the generator. Other locations such as the WCI, Wood Waste Solutions and Ajax Energy charge tipping fees that range from $30/tonne up to $75/tonne (Yeats, Wood Waste Solutions and Erwin Leonov, Waste Conversions Inc.). The processors also tend to provided variable rates depending on the type of wood waste, volumes generated and levels of contamination.

Those contacted have said that the tipping fees charged have gone down considerably due to the low tipping fees being charged by legally and illegally operated transfer operations.

The prices paid by end markets for clean wood product ranges from $10/tonne to $55/tonne. Transportation costs are an important factor to consider when hauling wood waste

Future Markets for GTA Collected Wood

Reduce
The introduction of alternative shipping containers such as plastic or metal pallets and boxes that compete with wood products will likely reduce the overall generation of wood waste.

The home building industry have been actively involved in education programs to reduce the amount of wood that is wasted through inefficient practices. The Greater Toronto Home Builders' Association has established an ongoing education program with members to implement waste reduction practices during construction such as off-site framing.

Reuse
Reuse of pallets through reconditioning or through pallet rental arrangements will reduce the need for new pallet manufacturing. The Canadian Pallet Council (CPC) is a non-profit association which tracks and monitors the movement of standardized pallets that are used by the consumer products and allied industries. The CPC pallet will last 135 trips if properly repaired to CPC specifications.

Recycle
Domtar could increase the percentage (from 10% of production to 20%) of GTA sourced wood waste in their process if quality and quantities could be improved and assured.

It is unlikely that new or existing wood waste processors or end markets will significantly increase their capacities to accept more material over the next year. This is primarily because illegal operations are charging much lower tipping fees as they tend to operate simple transfer operations with little separation. If the flow of wood waste is stemmed at the border and disposal landfill bans are enforced at GTA landfills, there will be a greater demand for processing capabilities and suitable end markets.

Imports and Exports
A limited amount of wood waste is imported into the GTA for the production of fire logs. This is mainly due to the high quality specifications required by some manufacturers. The imported material tends to come from Eastern Ontario and Quebec paper mills.

The export of IC&I wastes to the United States has greatly reduced the volume of wood waste available in the GTA. Reports from the wood waste producers

indicate that a high volume of wood waste is simply being sent for landfill disposal in the United States.

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SCHEDULE I

REGION OF DURHAM ESTIMATES

Existing System
Region of Durham

Component	Residential Waste Generated (Total) (tonnes)	Residential Waste Generated S-F plus Other (tonnes)	Residential Waste Generated M-F Hhlds (tonnes)	Residential Diversion (tonnes) Standard Blue Box	Residential Diversion (tonnes) Existing/ Committed	Residential Waste Landfilled All Households	Comp. of Disposed Waste (%) All Hhlds
Total Residential Waste (tonnes)	141,672	132,190	9,482	38,581	39,541	103,091	
Paper							
Newspaper	23,601	21,729	1,872	12,531	12,531	11,070	11
Corrugated cardboard (OCC)	3,641	3,352	289	1,446	1,446	2,195	2
Telephone Directories	334	307	26	115	115	219	
Mixed paper	21,761	20,035	1,727			21,761	21
Subtotal (Paper)	49,337	45,423	3,914	14,092	14,092	35,245	34
Glass	7,030	6,472	558	4,319	4,319	2,711	3
Tinplate Steel (ferrous)	5,215	4,846	369				
Aluminum (non-ferrous)	1,381	1,271	110				
Subtotal Metal (commingled)	6,596	6,118	478	3,177	3,177	3,419	3
Plastic							
PET	126	116	10	109	109	17	0
HDPE	6,277	5,779	498			6,277	6
Other Plastic	1,632	1,503	129			1,632	2
Subtotal (Plastic)	8,035	7,397	637	109	109	7,926	8
Organics							
Food wastes	31,636	29,126	2,510	3,664	4,317	27,972	27
Yard waste	21,589	21,589		9,769	10,076	11,819	11
Subtotal (Organics)	53,224	50,715	2,510	13,433	14,393	39,791	39
Wood Waste	1,130	1,040	90	621	621	509	0
Construction/Demolition Waste	2,134	1,965	169	752	752	1,382	1
Disposable Diapers	3,766	3,467	299			3,766	4
Textiles/Leather/Rubber	5,775	5,317	458	1,639	1,639	4,136	4
Other	4,645	4,276	369	439	439	4,206	4
Subtotal (Wood - Other)	17,450	16,066	1,384	3,451	3,451	13,999	14
TOTAL	141,672	132,190	9,482	38,581	39,541	103,091	100

Residential Diversion = 28%

Notes:

1) This analysis assumes that 101,576 S-F hhlds were served in 1992, and that there were 147,105 hhlds (single, multi and other) in total

2) Composition estimates based on East York data from "Residential Waste Composition Study, Vol. I of the Ontario Waste Comp. Study", Gore & Storrie Ltd., Jan/91 (excl. yard waste)

3) Yard Waste (comp. generated) data from "The Physical and Economic Dimensions of Municipal Solid Waste in Ontario", CH2MHill Eng. Ltd., Nov/91

4) White Goods (comp. generated) estimate (included in Tinplate Steel total) from "Residential Waste Comp. Study, Vol. I of the Ontario Waste Comp. Study", G & S Ltd., 1990

5) The split between single and multi-family households is based on the number of households and generation rates

Table 1.2
Existing/Committed System
Region of Durham

Component	Residential Waste Generated (Total) (tonnes)	Residential Waste Generated S-F plus Other (tonnes)	Residential Waste Generated M-F Hhlds (tonnes)	Residential Diversion (tonnes) Standard Blue Box	Residential Diversion (tonnes) Existing/ Committed	Residential Waste Landfilled All Households	Comp. of Disposed Waste (%) All Hhlds
Total Residential Waste (tonnes)	141,672	132,190	9,482	38,581	39,541	103,091	
Paper							
Newspaper	23,601	21,729	1,872	12,531	12,531	11,070	11
Corrugated cardboard (OCC)	3,641	3,352	289	1,446	1,446	2,195	2
Telephone Directories	334	307	26	115	115	219	
Mixed paper	21,761	20,035	1,727			21,761	21
Subtotal (Paper)	49,337	45,423	3,914	14,092	14,092	35,245	34
Glass	7,030	6,472	558	4,319	4,319	2,711	3
Tinplate Steel (ferrous)	5,215	4,846	369				
Aluminum (non ferrous)	1,381	1,271	110				
Subtotal Metal (commingled)	6,596	6,118	478	3,177	3,177	3,419	3
Plastic							
PET	126	116	10	109	109	17	0
HDPE	6,277	5,779	498			6,277	6
Other Plastic	1,632	1,503	129			1,632	2
Subtotal (Plastic)	8,035	7,397	637	109	109	7,926	8
Organics							
Food wastes	31,636	29,126	2,510	3,664	4,317	27,972	27
Yard waste	21,589	21,589		9,769	10,076	11,819	11
Subtotal (Organics)	53,224	50,715	2,510	13,433	14,393	39,791	39
Wood Waste	1,130	1,040	90	621	621	509	0
Construction/Demolition Waste	2,134	1,965	169	752	752	1,382	1
Disposable Diapers	3,766	3,467	299			3,766	4
Textiles/Leather/Rubber	5,775	5,317	458	1,639	1,639	4,136	4
Other	4,645	4,276	369	439	439	4,206	4
Subtotal (Wood - Other)	17,450	16,066	1,384	3,451	3,451	13,999	14
TOTAL	141,672	132,190	9,482	38,581	39,541	103,091	100

Residential Diversion = 28%

Notes

1) This analysis assumes that 102,576 S-F hhlds were served in 1992 and that there were 142,105 hhlds (single, multi and other) in total.

2) Composition estimates based on East York data from "Residential Waste Composition Study, Vol. I of the Ontario Waste Comp. Study" Gore & Storrie Ltd., Jan. 91 (excl. yard waste)

3) Yard Waste comp. generated data from "The Physical and Economic Dimensions of Municipal Solid Waste in Ontario", CH2MHill, Eng. Ltd., Nov. 91

4) White Goods (comp. generated estimate (included in Tinplate Steel total) from "Residential Waste Comp. Study, Vol. I of the Ontario Waste Comp. Study" G & S Ltd., 1991

5) Existing/committed system is the existing system plus 400 new backyard composters distributed

6) The split between single and multi-family households is based on the number of households and generation rates

Direct Cost System (Higher Diversion Estimate)
Region of Durham

Component	Residential Waste Generated (Total) (tonnes)	Residential Waste Generated S-F plus Other (tonnes)	Residential Waste Generated M-F Hhlds (tonnes)	Residential Diversion (tonnes) Standard Blue Box	Residential Diversion (tonnes) Existing/ Committed	Quinte Capture Rates (%)	Residential Diversion (tonnes) Direct Cost S-F + Other	Residential Diversion (tonnes) Direct Cost M-F	Residential Diversion (tonnes) Direct Cost All Hhlds	Residential Waste Landfilled All Households	Comp. of Disposed Waste (%) All Hhlds
Total Residential Waste (tonnes)	141,672	132,190	9,482	38,581	39,541		65,822	2,889	68,711	72,961	
Paper											
Newspaper	23,601	21,729	1,872	12,531	12,531	82.40	17,905	1,543	19,448	4,154	6
Corrugated cardboard (OCC)	3,641	3,352	289	1,446	1,446	63.40	2,125	183	2,308	1,332	2
Telephone Directories	334	307	26	115	115	76.00	234	20	254	80	
Mixed paper	21,761	20,035	1,727							21,761	30
Subtotal (Paper)	49,337	45,423	3,914	14,092	14,092	•	20,263	1,746	22,009	27,328	37
Glass	7,030	6,472	558	4,319	4,319	74.50	4,822	416	5,238	1,793	2
Tinplate Steel (ferrous)	5,215	4,846	369								
Aluminum (non-ferrous)	1,381	1,271	110								
Subtotal Metal (commingled)	6,596	6,118	478	3,177	3,177	78.20	4,784	374	5,158	1,438	2
Plastic											
PET	126	116	10	109	109	**86.50**	100	9	109	17	0
HDPE	6,277	5,779	498							6,277	9
Other Plastic	1,632	1,503	129							1,632	2
Subtotal (Plastic)	8,035	7,397	637	109	109		100	9	109	7,926	11
Organics											
Food wastes	31,636	29,126	2,510	3,664	4,317		15,476		15,476	16,160	22
Yard waste	21,589	21,589		9,769	10,076		17,271		17,271	4,318	6
Subtotal (Organics)	53,224	50,715	2,510	13,433	14,393		32,746	0	32,746	20,478	28
Wood Waste	1,130	1,040	90	621	621		559	62	621	509	1
Construction/Demolition Waste	2,134	1,965	169	752	752		677	75	752	1,382	2
Disposable Diapers	3,766	3,467	299						0	3,766	5
Textiles/Leather/Rubber	5,775	5,317	458	1,639	1,639		1,475	164	1,639	4,136	6
Other	4,645	4,276	369	439	439		395	44	439	4,206	6
Subtotal (Wood - Other)	17,450	16,066	1,384	3,451	3,451		3,106	345	3,451	13,999	19
TOTAL	141,672	132,190	9,482	38,581	39,541		65,822	2,889	68,711	72,961	100

Residential Diversion = 48%
(Higher Estimate)

Notes:

1) User Pay is an add-on to the existing/committed system.

2) User Pay assumes that diversion of existing dry recyclables will reach Quinte capture rates.

3) Durham Standard Blue Box materials: ONP, OCC, phone books, glass, metals, PET

4) The capture rate for PET is the existing Durham capture rate, since this exceeds the Quinte capture rate.

5) Telephone Directory generation based on Quinte estimate of 5 lb/hh/year available

6) User Pay assumes 80% of S-F, 40% of Other Hhlds receive backyard composters, which divert 240 kg/composter/yr (68% food, 32% yard)

7) Assumes at least 80% yard waste diverted by curbside+ composters

8) Diversion estimates based on Durham Commissioner's Report to Works Committee, 93 WR 5, Feb. 9/93

Table 1.4
Direct Cost System (lower M-F and lower backyard composter diversion)
Region of Durham

Component	Residential Waste Generated (Total) (tonnes)	Residential Waste Generated S-F plus Other (tonnes)	Residential Waste Generated M-F Hhlds (tonnes)	Residential Diversion (tonnes) Standard Blue Box	Residential Diversion (tonnes) Existing/ Committed	Quinte Capture Rates (%)	Residential Diversion (tonnes) Direct Cost S-F + Other	Residential Diversion (tonnes) Direct Cost M-F	Residential Diversion (tonnes) Direct Cost All Hhlds	Residential Waste Landfilled All Households	Comp. of Disposed Waste (%) All Hhlds
Total Residential Waste (tonnes)	141,672	132,190	9,482	38,581	39,541		60,019	1,114	61,133	80,539	
Paper											
Newspaper	23,601	21,729	1,872	12,531	12,531	82.40	17,905	463	18,368	5,234	6
Corrugated cardboard (OCC)	3,641	3,352	289	1,446	1,446	63.40	2,125	55	2,180	1,461	2
Telephone Directories	334	307	26	115	115	76.00	234	6	240	94	
Mixed paper	21,761	20,035	1,727							21,761	27
Subtotal (Paper)	49,337	45,423	3,914	14,092	14,092		20,263	524	20,787	28,550	35
Glass	7,030	6,472	558	4,319	4,319	74.50	4,822	125	4,947	2,084	3
Tinplate Steel (ferrous)	5,215	4,846	369								
Aluminum (non ferrous)	1,381	1,271	110								
Subtotal Metal (commingled)	6,596	6,118	478	3,177	3,177	78.20	4,784	112	4,896	1,700	2
Plastic											
PET	126	116	10	109	109	86.50	100	9	109	17	0
HDPE	6,277	5,779	498							6,277	8
Other Plastic	1,632	1,503	129							1,632	2
Subtotal (Plastic)	8,035	7,397	637	109	109		100	9	109	7,926	10
Organics											
Food wastes	31,636	29,126	2,510	3,664	4,317		9,673		9,673	21,963	27
Yard waste	21,589	21,589		9,769	10,076		17,271		17,271	4,318	5
Subtotal (Organics)	53,224	50,715	2,510	13,433	14,393		26,944	0	26,944	26,281	33
Wood Waste	1,130	1,040	90	621	621		559	62	621	509	1
Construction/Demolition Waste	2,134	1,965	169	752	752		677	75	752	1,382	2
Disposable Diapers	3,766	3,467	299						0	3,766	5
Textiles/Leather/Rubber	5,775	5,317	458	1,639	1,639		1,475	164	1,639	4,136	5
Other	4,645	4,276	369	439	439		395	44	439	4,206	5
Subtotal (Wood - Other)	17,450	16,066	1,384	3,451	3,451		3,106	345	3,451	13,999	17
TOTAL	141,672	132,190	9,482	38,581	39,541		60,019	1,114	61,133	80,539	100

Residential Diversion = 43%
(Lower Estimate)

Notes:
1) User Pay is an add on to the existing/committed system
2) User Pay assumes that diversion of existing 3Rs activities will reach Quinte capture rates
3) Durham Standard Blue Box materials: ONP, OCC, phone books, glass, metals, PET
4) The capture rate for PET is the existing Durham capture rate, since this exceeds the Quinte capture rate
5) Telephone Directory generation based on Quinte estimate of [illegible] kg/year available
6) This scenario assumes [illegible] of S-F, [illegible] of Other Hhlds receive backyard composters. The first [illegible] of Hhlds divert 240 kg/comp/yr (68% food, 32% yard); the remainder divert [illegible] kg/comp/yr
7) Assumes [illegible] yard waste diverted by [illegible] composters
8) This scenario assumes that multi-family households divert 3Rs activities at [illegible] of the Quinte capture rate

Expanded Blue Box System
Region of Durham

Component	Residential Waste Generated (Total) (tonnes)	Residential Waste Generated S-F plus Other (tonnes)	Residential Waste Generated M-F Hhlds (tonnes)	Residential Diversion (tonnes) Standard Blue Box	Residential Diversion (tonnes) Existing/ Committed	Quinte Capture Rates (%)	Residential Diversion (tonnes) Exp. BB S-F + Other	Residential Diversion (tonnes) Exp. BB M-F	Residential Diversion (tonnes) Exp. BB All Hhlds	Residential Waste Landfilled All Households	Comp. of Disposed Waste (%) All Hhlds
Total Residential Waste (tonnes)	141,672	132,190	9,482	38,581	39,541		75,028	3,850	78,878	62,794	
Paper											
Newspaper	23,601	21,729	1,872	12,531	12,531	82.40	17,905	1,543	19,448	4,154	7
Corrugated cardboard (OCC)	3,641	3,352	289	1,446	1,446	63.40	2,125	183	2,308	1,332	2
Telephone Directories	334	307	26	115	115	76.00	234	20	254	80	
Mixed paper	21,761	20,035	1,727			37.46	7,505	647	8,152	13,609	22
Subtotal (Paper)	49,337	45,423	3,914	14,092	14,092		27,768	2,393	30,161	19,176	30
Glass	7,030	6,472	558	4,319	4,319	74.50	4,822	416	5,238	1,793	3
Tinplate Steel (ferrous)	5,215	4,846	369								
Aluminum (non-ferrous)	1,381	1,271	110								
Subtotal Metal (commingled)	6,596	6,118	478	3,177	3,177	78.20	4,784	374	5,158	1,438	2
Plastic											
PET	126	116	10	109	109	83.40	96	8	105	21	0
HDPE	6,277	5,779	498			57.40	3,317	286	3,603	2,674	4
Other Plastic	1,632	1,503	129			22.00	331	28	359	1,273	2
Subtotal (Plastic)	8,035	7,397	637	109	109		3,744	323	4,067	3,968	6
Organics											
Food wastes	31,636	29,126	2,510	3,664	4,317		15,476		15,476	16,160	26
Yard waste	21,589	21,589		9,769	10,076		15,328		15,328	6,261	10
Subtotal (Organics)	53,224	50,715	2,510	13,433	14,393		30,803	0	30,803	22,421	36
Wood Waste	1,130	1,040	90	621	621		559	62	621	509	1
Construction/Demolition Waste	2,134	1,965	169	752	752		677	75	752	1,382	2
Disposable Diapers	3,766	3,467	299						0	3,766	6
Textiles/Leather/Rubber	5,775	5,317	458	1,639	1,639		1,475	164	1,639	4,136	7
Other	4,645	4,276	369	439	439		395	44	439	4,206	7
Subtotal (Wood - Other)	17,450	16,066	1,384	3,451	3,451		3,106	345	3,451	13,999	22
TOTAL	141,672	132,190	9,482	38,581	39,541		75,028	3,850	78,878	62,794	100

Residential Diversion = 56%
(Higher Estimate)

Notes:

1) Expanded Blue Box is an add-on to the existing/committed system

2) 80% of S-F, and 40% of Other Hhlds receive backyard composters, which divert 240 kg/composter/yr (68% food, 32% yard)

3) Expanded Blue Box assumes that the dry recyclables diverted by the Quinte program will be diverted at the Quinte capture rate in Durham

3) The capture rate for PET is the existing Durham capture rate, since this exceeds the Quinte capture rate

4) Telephone Directory generation based on Quinte estimate of 5 lb/hh/year available

5) Diversion estimates based on Durham Commissioner's Report to Works Committee, 93-WR-5, Feb 9/93

Table I.6
Expanded Blue Box System (lower M-F and lower backyard composter diversion)
Region of Durham

Component	Residential Waste Generated (Total) (tonnes)	Residential Waste Generated S-F plus Other (tonnes)	Residential Waste Generated M-F Hhlds (tonnes)	Residential Diversion (tonnes) Standard Blue Box	Residential Diversion (tonnes) Existing/ Committed	Quinte Capture Rates (%)	Residential Diversion (tonnes) Exp. BB S-F + Other	Residential Diversion (tonnes) Exp. BB M-F	Residential Diversion (tonnes) Exp. BB All Hhlds	Residential Waste Landfilled All Households	Comp. of Disposed Waste (%) All Hhlds
Total Residential Waste (tonnes)	141,672	132,190	9,482	38,581	39,541		66,498	1,403	67,900	73,772	
Paper											
Newspaper	23,601	21,729	1,872	12,531	12,531	82.40	17,905	463	18,368	5,234	7
Corrugated cardboard (OCC)	3,641	3,352	289	1,446	1,446	63.40	2,125	55	2,180	1,461	2
Telephone Directories	334	307	26	115	115	76.00	234	6	240	94	
Mixed paper	21,761	20,035	1,727			37.46	7,505	194	7,699	14,062	19
Subtotal (Paper)	49,337	45,423	3,914	14,092	14,092		27,768	718	28,486	20,851	28
Glass	7,030	6,472	558	4,319	4,319	74.50	4,822	125	4,947	2,084	3
Tinplate Steel (ferrous)	5,215	4,846	369								
Aluminum (non ferrous)	1,381	1,271	110								
Subtotal Metal (commingled)	6,596	6,118	478	3,177	3,177	78.20	4,784	112	4,896	1,700	2
Plastic											
PET	126	116	10	109	109	86.50	100	9	109	17	0
HDPE	6,277	5,779	498			57.40	3,317	86	3,403	2,874	4
Other Plastic	1,632	1,503	129			22.00	331	9	339	1,293	2
Subtotal (Plastic)	8,035	7,397	637	109	109		3,748	103	3,851	4,184	6
Organics											
Food wastes	31,636	29,126	2,510	3,664	4,317		9,673		9,673	21,963	30
Yard waste	21,589	21,589		9,769	10,076		12,597		12,597	8,992	12
Subtotal (Organics)	53,224	50,715	2,510	13,433	14,393		22,270	0	22,270	30,955	42
Wood Waste	1,130	1,040	90	621	621		559	62	621	509	1
Construction/Demolition Waste	2,134	1,965	169	752	752		677	75	752	1,382	2
Disposable Diapers	3,766	3,467	299						0	3,766	5
Textiles/Leather Rubber	5,775	5,317	458	1,639	1,639		1,475	164	1,639	4,136	6
Other	4,645	4,276	369	439	439		395	44	439	4,206	6
Subtotal (Wood - Other)	17,450	16,066	1,384	3,451	3,451		3,106	345	3,451	13,999	19
TOTAL	141,672	132,190	9,482	38,581	39,541		66,498	1,403	67,900	73,772	100

Residential Diversion = 48%
(Lower Estimate)

Notes

1) Expanded Blue Box is an add-on to the existing/committed system.

2) This scenario assumes 80% of S-F, 40% of Other Hhlds receive backyard composters. The first 20% of hhlds divert 240 kg/comp/yr (68% food, 32% yard); the remainder divert [illegible] kg/comp/yr.

3) The capture rate for PET is the existing Durham capture rate, since this exceeds the Quinte capture rate.

4) Telephone Directory generation based on Quinte estimate of [illegible]

5) This scenario assumes that multi-family households divert the recyclables at 80% of the Quinte capture rate.

Wet/Dry System
(Higher Diversion Estimate)
Region of Durham

Component	Residential Waste Generated (Total) (tonnes)	Residential Waste Generated S-F plus Other (tonnes)	Residential Waste Generated M-F Hhlds (tonnes)	Residential Diversion (tonnes) Standard Blue Box	Residential Diversion (tonnes) Existing/ Committed	Quinte Capture Rates (%)	Residential Diversion (tonnes) Wet/Dry S-F + Other	Residential Diversion (tonnes) Wet/Dry M-F	Residential Diversion (tonnes) Wet/Dry All Hhlds	Residential Waste Landfilled All Households	Comp. of Disposed Waste (%) All Hhlds
Total Residential Waste (tonnes)	141,672	132,190	9,482	38,581	39,541		84,799	5,858	90,658	51,014	
Paper											
Newspaper	23,601	21,729	1,872	12,531	12,531	82.40	17,905	1,543	19,448	4,154	8
Corrugated cardboard (OCC)	3,641	3,352	289	1,446	1,446	63.40	2,125	183	2,308	1,332	3
Telephone Directories	334	307	26	115	115	76.00	234	20	254	80	
Mixed paper	21,761	20,035	1,727			37.46	7,505	647	8,152	13,609	27
Subtotal (Paper)	49,337	45,423	3,914	14,092	14,092		27,768	2,393	30,161	19,176	37
Glass	7,030	6,472	558	4,319	4,319	74.50	4,822	416	5,238	1,793	4
Tinplate Steel (ferrous)	5,215	4,846	369								
Aluminum (non-ferrous)	1,381	1,271	110								
Subtotal Metal (commingled)	6,596	6,118	478	3,177	3,177	78.20	4,784	374	5,158	1,438	3
Plastic											
PET	126	116	10	109	109	86.50	100	9	109	17	0
HDPE	6,277	5,779	498			57.40	3,317	286	3,603	2,674	5
Other Plastic	1,632	1,503	129			22.00	331	28	359	1,273	2
Subtotal (Plastic)	8,035	7,397	637	109	109		3,748	323	4,071	3,964	8
Organics											
Food wastes	31,636	29,126	2,510	3,664	4,317		23,301	2,008	25,309	6,327	12
Yard waste	21,589	21,589		9,769	10,076		17,271		17,271	4,318	8
Subtotal (Organics)	53,224	50,715	2,510	13,433	14,393		40,572	2,008	42,580	10,645	21
Wood Waste	1,130	1,040	90	621	621		559	62	621	509	1
Construction/Demolition Waste	2,134	1,965	169	752	752		677	75	752	1,382	3
Disposable Diapers	3,766	3,467	299						0	3,766	7
Textiles/Leather/Rubber	5,775	5,317	458	1,639	1,639	.	1,475	164	1,639	4,136	8
Other	4,645	4,276	369	439	439		395	44	439	4,206	8
Subtotal (Wood - Other)	17,450	16,066	1,384	3,451	3,451		3,106	345	3,451	13,999	27
TOTAL	**141,672**	**132,190**	**9,482**	**38,581**	**39,541**		**84,799**	**5,858**	**90,658**	**51,014**	**100**

Residential Diversion = 64%
(Higher Estimate)

Notes:

1) Wet/Dry is an add-on to the existing/committed system

2) Dry recyclables are assumed to be diverted at the same rate as Expanded Blue Box (i.e. Quinte capture rates and materials)

3) 80% of Organics (food and yard) will be diverted, either through wet/dry system, or backyard composters

4) 80% of S-F, and 40% of Other Hhlds receive backyard composters, which divert 240 kg/composter/yr (68% food, 32% yard)

5) The capture rate for PET is the existing Durham capture rate, since this exceeds the Quinte capture rate

6) Telephone Directory generation based on Quinte estimate of 5 lb/hh/year available

Table I.8
Wet/Dry System
(lower M-F diversion of wet dry materials)
Region of Durham

Component	Residential Waste Generated (Total) (tonnes)	Residential Waste Generated S-F plus Other (tonnes)	Residential Waste Generated M-F Hhlds (tonnes)	Residential Diversion (tonnes) Standard Blue Box	Residential Diversion (tonnes) Existing/ Committed	Quinte Capture Rates (%)	Residential Diversion (tonnes) Wet/Dry S-F + Other	Residential Diversion (tonnes) Wet/Dry M-F	Residential Diversion (tonnes) Wet/Dry All Hhlds	Residential Waste Landfilled All Households	Comp. of Disposed Waste (%) All Hhlds
Total Residential Waste (tonnes)	141,672	132,190	9,482	38,581	39,541		84,799	2,156	86,955	54,717	
Paper											
Newspaper	23,601	21,729	1,872	12,531	12,531	82.40	17,905	463	18,368	5,234	10
Corrugated cardboard (OCC)	3,641	3,352	289	1,446	1,446	63.40	2,125	55	2,180	1,461	3
Telephone Directories	334	307	26	115	115	76.00	234	6	240	94	
Mixed paper	21,761	20,035	1,727			37.46	7,505	194	7,699	14,062	26
Subtotal (Paper)	49,337	45,423	3,914	14,092	14,092		27,768	718	28,486	20,851	38
Glass	7,230	6,472	558	4,319	4,319	74.50	4,822	125	4,947	2,084	4
Tinplate Steel (ferrous)	5,215	4,846	369								
Aluminum (non-ferrous)	1,381	1,271	110								
Subtotal Metal (commingled)	6,596	6,118	478	3,177	3,177	78.20	4,784	112	4,896	1,700	3
Plastic											
PET	126	116	10	109	109	86.50	100	9	109	17	0
HDPE	6,277	5,779	498			57.40	3,317	86	3,403	2,874	5
Other Plastic	1,632	1,503	129			22.00	331	9	339	1,293	2
Subtotal (Plastic)	8,035	7,397	637	109	109		3,748	103	3,851	4,184	8
Organics											
Food waste	31,636	29,126	2,510	3,664	4,317		23,301	753	24,054	7,582	14
Yard waste	21,589	21,589		9,769	10,076		17,271		17,271	4,318	8
Subtotal (Organics)	53,224	50,715	2,510	13,433	14,393		40,572	753	41,325	11,900	22
Wood Waste	1,130	1,040	90	621	621		559	62	621	509	1
Construction Demolition Waste	2,134	1,965	169	752	752		677	75	752	1,382	3
Disposable Diapers	3,766	3,467	299						0	3,766	7
Textiles/Leather Rubber	5,775	5,317	458	1,639	1,639		1,475	164	1,639	4,136	8
Other	4,645	4,276	369	439	439		395	44	439	4,206	8
Subtotal (Wood - Other)	17,450	16,066	1,384	3,451	3,451		3,106	345	3,451	13,999	26
TOTAL	141,672	132,190	9,482	38,581	39,541		84,799	2,156	86,955	54,717	100

Residential Diversion = 61%
(Lower Estimate)

Notes:
1) Wet/Dry is an addition to the existing/committed system.
2) Dry recyclables are assumed to be diverted at the same rate as Expanded Blue Box (i.e. Quinte capture rates and materials) for single family plus Other households.
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]

Mixed Waste Processing System
plus Backyard Composting to Saturation
Region of Durham

Component	Residential Waste Generated (tonnes) All Hhlds	Res. Diversion (tonnes) Exist/Comm + B.Y. Compos.	Residential Waste Landfilled (tonnes)	Recovered for Recycling in MSW Processing	MSW plus E/C Diversion (tonnes)	Recovered for Composting in MSW Processing	MSW plus E/C plus Composting (landfilled)	MSW plus E/C plus Composting (marketed)	Residue Sent to Landfill from MSW Processing
Total Residential Waste (tonnes)	141,672	55,951	85,721						
Paper									
Newspaper	23,601	12,531	11,070	3,321	15,852	6,587	19,146	22,439	1,162
Corrugated cardboard (OCC)	3,641	1,446	2,195	1,097	2,543	933	3,010	3,476	165
Telephone Directories	334	115	219	109	224	93	271	317	16
Mixed paper	21,761		21,761	2,176	2,176	16,647	10,500	18,823	2,938
Subtotal (Paper)	49,337	14,092	35,245	6,704	20,796	24,260	32,926	45,056	4,281
Glass	7,030	4,319	2,711	542	4,861	0	4,861	4,861	2,169
Tinplate Steel (ferrous)	5,215			0	0	0	0	0	0
Aluminum (non-ferrous)	1,381			0	0	0	0	0	0
Subtotal Metal (commingled)	6,596	3,177	3,419	2,250	5,427	0	5,427	5,427	1,169
Plastic									
PET	126	109	17	17	126	0	126	126	0
HDPE	6,277		6,277	1,569	1,569	0	1,569	1,569	4,708
Other Plastic	1,632		1,632	0	0	0	0	0	1,632
Subtotal (Plastic)	8,035	109	7,926	1,586	1,695	0	1,695	1,695	6,340
Organics									
Food wastes	31,636	15,476	16,160	0	15,476	13,736	22,344	29,212	2,424
Yard waste	21,589	15,328	6,261	0	15,328	5,635	18,145	20,962	626
Subtotal (Organics)	53,224	30,803	22,421	0	30,803	19,371	40,489	50,174	3,050
Wood Waste	1,130	621	509	0	621	51	646	672	458
Construction/Demolition Waste	2,134	752	1,382	0	752	138	821	890	1,244
Disposable Diapers	3,766		3,766	0	0	0	0	0	3,766
Textiles/Leather/Rubber	5,775	1,639	4,136	414	2,053	0	2,053	2,053	3,722
Other	4,645	439	4,206	0	439	0	439	439	4,206
Subtotal (Wood - Other)	17,450	3,451	13,999	414	3,865	189	3,959	4,054	13,396
TOTAL	141,672	55,951	85,721	11,496	67,447	43,820	89,357	111,267	30,405
	Diversion =	39%			48%		63%	79%	
							(compost landfilled)	(compost marketed)	

(Higher Estimate)

Notes:

1) MSW is an add-on to the existing/committed system

2) 80% of single-family and 40% of Other Households receive composters. These divert 240 kg/compost/yr (68% food, 32% yard)

3) MSW assumes that garbage put out for collection is processed to recover dry recyclables and compostable organics. The residue is sent to landfill

4) MSW analysis assumes that there is a 50% mass reduction of organics during composting

Table 1.10
Mixed Waste Processing System
(lower backyard composter diversion)
Region of Durham

Component	Residential Waste Generated (tonnes) All Hhlds	Res. Diversion (tonnes) Exist/Comm + B.Y. Compos.	Residential Waste Landfilled (tonnes)	Recovered for Recycling in MSW Processing	MSW plus E/C Diversion (tonnes)	Recovered for Composting in MSW Processing	MSW plus E/C plus Composting (landfilled)	MSW plus E/C plus Composting (marketed)	Residue Sent to Landfill from MSW Processing
Total Residential Waste (tonnes)	141,672	47,418	94,254						
Paper									
Newspaper	23,601	12,531	11,070	3,321	15,852	6,587	19,146	22,439	1,162
Corrugated cardboard (OCC)	3,641	1,446	2,195	1,097	2,543	933	3,010	3,476	165
Telephone Directories	334	115	219	109	224	93	271	317	16
Mixed paper	21,761		21,761	2,176	2,176	16,647	10,500	18,823	2,938
Subtotal (Paper)	49,337	14,092	35,245	6,704	20,796	24,260	32,926	45,056	4,281
Glass	7,030	4,319	2,711	542	4,861	0	4,861	4,861	2,169
Tinplate Steel (ferrous)	5,215			0	0	0	0	0	0
Aluminum (non-ferrous)	1,381			0	0	0	0	0	0
Subtotal Metal (commingled)	6,596	3,177	3,419	2,250	5,427	0	5,427	5,427	1,169
Plastic									
PET	126	109	17	17	126	0	126	126	0
HDPE	6,277		6,277	1,569	1,569	0	1,569	1,569	4,708
Other Plastic	1,632		1,632	0	0	0	0	0	1,632
Subtotal (Plastic)	8,035	109	7,926	1,586	1,695	0	1,695	1,695	6,340
Organics									
Food wastes	31,636	9,673	21,963	0	9,673	18,669	19,007	28,341	3,294
Yard waste	21,589	12,597	8,992	0	12,597	8,092	16,643	20,689	899
Subtotal (Organics)	53,224	22,270	30,955	0	22,270	26,761	35,650	49,031	4,194
Wood Waste	1,130	621	509	0	621	51	646	672	458
Construction/Demolition Waste	2,134	752	1,382	0	752	138	821	890	1,244
Disposable Diapers	3,766		3,766	0	0	0	0	0	3,766
Textiles/Leather/Rubber	5,775	1,639	4,136	414	2,053	0	2,053	2,053	3,722
Other	4,645	439	4,206	0	439	0	439	439	4,206
Subtotal (Wood - Other)	17,450	3,451	13,999	414	3,865	189	3,959	4,054	13,396
TOTAL	141,672	47,418	94,254	11,496	58,913	51,210	84,518	110,123	31,549
Diversion =		33%			42%		60% (compost landfilled) (Lower Estimate)	78% (compost marketed)	

Notes:

1) MSW is an add-on to the existing/committed system

2) 80% of single family and 40% of Other Households receive composters. The first 25% of households divert 240 kg/compost/yr; the remainder divert 100 kg/composter/year (68% food; 32% yard)

3) MSW assumes that garbage post-rec'l'e collection is processed to recover dry recyclables and compostable organics. The residue is sent to landfill

4) MSW analysis assumes that there is a 30% mass reduction of organics during composting

SCHEDULE J

METRO TORONTO ESTIMATES

Table J.1
Existing System
Metropolitan Toronto

Component	Residential Waste Generated (tonnes) 1992	Residential Waste Generated S-F+Other	Residential Waste Generated M-F	Residential Diversion (tonnes) 1992	Residential Waste Landfilled (by difference) 1992	Composition of Disposed Waste %
Total Residential Waste (tonnes)	1,077,245	732,030	345,215	208,632	868,613	
Paper						
Newspaper	188,501	120,328	68,173	57,995	130,506	15
Corrugated cardboard (OCC)	29,077	18,561	10,516	2,786	26,291	3
Telephone Directories	3,166	2,025	1,141	1,098	2,068	
Mixed paper	173,303	110,623	62,680		173,303	20
Subtotal (Paper)	394,048	251,538	142,510	61,879	332,169	38
Glass	56,149	35,843	20,307	23,789	32,360	4
Tinplate Steel (ferrous)	40,255	26,838	13,417	18,314	21,941	3
Aluminum (non-ferrous)	11,029	7,040	3,989	387	10,642	1
Plastic						
PET	1,003	640	363	635	368	
HDPE	50,133	32,002	18,131	1,141	48,992	
Other Plastic	13,035	8,321	4,714		13,035	
Subtotal (Plastic)	64,171	40,963	23,208	1,776	62,395	7
Organics						
Food wastes	252,672	161,291	91,380	17,136	235,536	
Yard waste	119,551	119,551	0	79,126	40,425	
Subtotal (Organics)	372,223	280,842	91,380	96,262	275,961	32
Wood Waste	9,024	5,760	3,264		9,024	
Construction/Demolition Waste	17,045	10,881	6,165	1,500	15,545	
Disposable Diapers	30,080	19,201	10,879		30,080	
Textiles/Leather/Rubber	46,123	29,442	16,681		46,123	
Other	37,099	23,682	13,417	4,725	32,374	
Subtotal (Wood - Other)	139,371	88,966	50,404	6,225	133,146	15
TOTAL	**1,077,245**	**732,030**	**345,215**	**208,632**	**868,613**	**100**

Residential Diversion = 19%

Notes:

1) Composition estimates based on East York data, from "Residential Waste Composition Study, Vol I of the Ontario Waste Composition Study", Gore&Storrie, Jan/91 (e

2) Yard Waste (generated) data from "The Physical and Economic Dimensions of Municipal Solid Waste in Ontario", CH2MHILL Engineering Ltd., Nov/91

3) White Goods (generated) estimate (included in Tinplate Steel total) from Gore & Storrie report listing in (1) above

4) Diversion estimates from unpublished table and other tables in 1992 Metro Works Annual Report, personal communication with A. Nanda, Metro Works (June/93)

5) White goods are included as ferrous (steel) in diversion column

6) Other category includes HHW, misc. items collected at depots, and residue from MRFs

Table J.2
Existing/Committed System
Metropolitan Toronto

Component	Residential Waste Generated (tonnes) 1992	Residential Waste Generated S-F+Other	Residential Waste Generated M-F	Residential Diversion (tonnes) - 1992 Std. Blue Box	Additional Diversion Existing/ Committed	Total Residential Diversion (tonnes)	Residential Waste Landfilled (by difference) 1992	Composition of Disposed Waste %
Total Residential Waste (tonnes)	1,077,245	732,030	345,215	208,632	21,718	230,350	[illegible]	
Paper								
Newspaper	188,501	120,328	68,173	57,995	[illegible]	63,951	[illegible]	18
Corrugated cardboard (OCC)	29,077	18,561	10,516	2,780	[illegible]	[illegible]	26,038	[illegible]
Telephone Directories	3,166	2,025	1,141	1,098	114	1,212	[illegible]	
Mixed paper	171,305	108,623	62,682		3,500	3,500	167,805	20
Subtotal (Paper)	[illegible]	251,538	142,512	61,879	[illegible]	[illegible]	322,340	38
Glass	54,148	33,843	20,307	[illegible]	2,394	28,183	[illegible]	3
Tinplate Steel (ferrous)	42,255	28,838	13,417	18,314	1,473	19,787	[illegible]	2
Aluminum (non-ferrous)	[illegible]	7,042	3,989	383	28	411	[illegible]	1
Plastic								
PET	1,003	640	363	635	62	697	306	
HDPE	50,133	32,002	18,131	1,141	111	1,252	48,881	
Other Plastic	13,035	8,322	4,714			0	13,035	
Subtotal (Plastic)	64,171	40,964	23,208	1,776	173	1,949	62,222	7
Organics								
Food waste	252,672	161,291	91,380	17,136	2,856	19,992	232,680	
Yard waste	119,551	119,551	0	79,126	5,082	84,208	35,343	
Subtotal (Organics)	372,223	280,842	91,380	96,262	7,938	104,200	268,023	32
Wood Waste	9,024	5,760	3,264			0	9,024	
Construction Demolition Waste	17,047	10,881	6,165	1,500	-378	1,122	15,925	
Disposable Diapers	30,080	19,201	10,879			0	30,080	
Textiles/Leather/Rubber	46,123	29,442	16,681			0	46,123	
Other	37,099	23,682	13,417	4,725	267	4,992	32,107	
Subtotal (Wood - Other)	139,371	88,966	50,404	6,225	-111	6,114	133,257	16
TOTAL	1,077,245	732,030	345,215	208,632	21,718	230,350	846,895	100

Residential Diversion = 21%

Notes

1) Composition estimates based on East York data from "Residential Waste Composition Study, Vol. I of the Ontario Waste Composition Study" [illegible] yard waste.

2) [illegible]

3) [illegible]

4) [illegible]

5) [illegible]

6) [illegible] ded [illegible]

7) [illegible]

Table J.3
Direct Cost System
(higher diversion estimate)
Metropolitan Toronto

Component	Residential Waste Generated (tonnes) 1992	Residential Waste Generated S-F+Other	Residential Waste Generated M-F	Residential Diversion (tonnes) - 1992 Std. Blue Box	Additional Diversion Existing/ Committed	Quinte Capture Rates	Total Residential Diversion (tonnes)	Residential Waste Landfilled (by difference) 1992	Composition of Disposed Waste %
Total Residential Waste (tonnes)	1,077,245	732,030	345,215	208,632	21,718		453,655	623,590	
Paper									
Newspaper	188,501	120,328	68,173	57,995	5,956	82.40	155,325	33,176	5
Corrugated cardboard (OCC)	29,077	18,561	10,516	2,786	253	63.40	18,435	10,642	2
Telephone Directories	3,166	2,025	1,141	1,098	114	76.00	2,406	760	
Mixed paper	173,303	110,623	62,680		3,500		3,500	169,803	27
Subtotal (Paper)	394,048	251,538	142,510	61,879	9,823		179,666	214,382	34
Glass	56,149	35,843	20,307	23,789	2,394	74.50	41,831	14,318	2
Tinplate Steel (ferrous)	40,255	26,838	13,417	18,314	1,473	78.00	31,399	8,856	1
Aluminum (non-ferrous)	11,029	7,040	3,989	387	28	81.70	9,011	2,018	0
Plastic									
PET	1,003	640	363	635	62	83.40	836	166	
HDPE	50,133	32,002	18,131	1,141	111	57.40	28,777	21,357	
Other Plastic	13,035	8,321	4,714				0	13,035	
Subtotal (Plastic)	64,171	40,963	23,208	1,776	173		29,613	34,558	6
Organics									
Food wastes	252,672	161,291	91,380	17,136	2,856		55,230	197,441	
Yard waste	119,551	119,551	0	79,126	5,082		100,791	18,760	
Subtotal (Organics)	372,223	280,842	91,380	96,262	7,938		156,021	216,202	35
Wood Waste	9,024	5,760	3,264				0	9,024	
Construction/Demolition Waste	17,045	10,881	6,165	1,500	-378		1,122	15,923	
Disposable Diapers	30,080	19,201	10,879				0	30,080	
Textiles/Leather/Rubber	46,123	29,442	16,681				0	46,123	
Other	37,099	23,682	13,417	4,725	267		4,992	32,107	
Subtotal (Wood - Other)	139,371	88,966	50,404	6,225	-111		6,114	133,257	21
TOTAL	1,077,245	732,030	345,215	208,632	21,718		453,655	623,590	100

Residential Diversion = 42%
(higher estimate)

Notes:

1) Composition estimates based on East York data, from "Residential Waste Composition Study, Vol. I of the Ontario Waste Composition Study", Gore&Storrie, Jan/91 (excl. yard waste).

2) Yard Waste (generated) data from "The Physical and Economic Dimensions of Municipal Solid Waste in Ontario", CH2MHILL Engineering Ltd., Nov/91

3) White Goods (generated) estimate (included in Tinplate Steel total) from Gore & Storrie report listing in (1) above.

4) Diversion estimates from unpublished table and other tables in 1992 Metro Works Annual Report, personal communication with A. Nanda - Metro Works (June/93)

5) User Pay is an add-on to the existing/committed system

6) User pay system assume 80% of S-F, 40% of Other Hhlds receive backyard composters, which divert 240 kg/composter/yr (68% food, 32% yard)

7) User Pay assumes that diversion of existing dry recyclables will reach Quinte capture rates

8) Assumes at least 80% yard waste diverted by curbside+ composters

Table J.4
Direct Cost System
(lower M-F and backyard composter diversion)
Metropolitan Toronto

Component	Residential Waste Generated (tonnes) 1992	Residential Waste Generated S-F+Other	Residential Waste Generated M-F	Residential Diversion Existing (tonnes)	Additional Diversion Existing/ Committed	Quinte Capture Rates	Direct Cost Diversion S-F+Other (tonnes)	Direct Cost Diversion M-F (tonnes)	Total Residential Diversion (tonnes)	Residential Waste Landfilled (tonnes)	Disposed Waste Comp. %
Total Residential Waste (tonnes)	1,077,245	732,030	345,215	208,632	21,718				357,272	719,973	
Paper											
Newspaper	188,501	120,328	68,173	57,995	5,956	82.40	99,151	16,852	116,003	72,498	10
Corrugated cardboard (OCC)	29,077	18,561	10,516	2,786	253	63.40	11,768	2,000	13,768	15,309	2
Telephone Directories	3,166	2,025	1,141	1,098	114	76.00	1,539	260	1,799	1,367	
Mixed paper	173,303	110,623	62,680		3,500		3,150	350	3,500	169,803	24
Subtotal (Paper)	394,048	251,538	142,510	61,879	9,823		115,607	19,463	135,070	258,978	36
Glass	56,149	35,843	20,307	23,789	2,394	74.50	26,703	4,539	31,241	24,908	3
Tinplate Steel (ferrous)	40,255	26,838	13,417	18,314	1,473	78.00	20,934	3,140	24,073	16,182	2
Aluminum (non-ferrous)	11,029	7,040	3,989	387	28	81.70	5,752	978	6,730	4,300	1
Plastic											
PET	1,003	640	363	635	62	83.40	534	91	625	378	
HDPE	50,133	32,002	18,131	1,141	111	57.40	18,369	3,122	21,491	28,642	
Other Plastic	13,035	8,321	4,714						0	13,035	
Subtotal (Plastic)	64,171	40,963	23,208	1,776	173		18,903	3,213	22,116	42,055	6
Organics											
Food wastes	252,672	161,291	91,380	17,136	2,856		36,288		36,288	216,384	
Yard waste	119,551	119,551	0	79,126	5,082		95,641		95,641	23,910	
Subtotal (Organics)	372,223	280,842	91,380	96,262	7,938		131,928	0	131,928	240,294	33
Wood Waste	9,024	5,760	3,264						0	9,024	
Construction/Demolition Waste	17,045	10,881	6,165	1,500	-378		1,010	112	1,122	15,923	
Disposable Diapers	30,080	19,201	10,879						0	30,080	
Textiles/Leather/Rubber	46,123	29,442	16,681						0	46,123	
Other	37,099	23,682	13,417	4,725	267		4,493	499	4,992	32,107	
Subtotal (Wood - Other)	139,371	88,966	50,404	6,225	-111		5,503	611	6,114	133,257	19
TOTAL	1,077,245	732,030	345,215	208,632	21,718		325,330	31,943	357,272	719,973	100

Residential Diversion = 33%
(lower estimate)

Notes:

1) Composition estimates based on East York data, from "Residential Waste Composition Study, Vol. I of the Ontario Waste Composition Study", Gore&Storrie, Jan/91 (excl. yard waste)

2) Yard Waste (generated) data from "The Physical and Economic Dimensions of Municipal Solid Waste in Ontario", CH2MHILL Engineering Ltd., Nov/91

3) White Goods (generated) estimate (included in Tinplate Steel total) from Gore & Storrie report listing in (1) above

4) User Pay is an addition to the existing/committed system

5) User pay system assume 80% of S-F, 40% of Other HHs receive backyard composters. In this scenario, the first 25% of hhlds divert 240 kg/comp/yr (68% food, 32% yard); the remainder divert 100 kg/comp/yr

6) Assumes at least 80% [illegible] waste diverted by [illegible] composters

7) [illegible] assumes that [illegible] households [illegible] recyclables at 85% of the Quinte capture rate

Table [illegible]

Expanded Blue Box System
(Higher Diversion Estimate)
Metropolitan Toronto

Component	Residential Waste Generated (tonnes) 1992	Residential Waste Generated S-F+Other	Residential Waste Generated M-F	Res. Div. (tonnes) Existing/ Committed	Capture Rate (%) Exp. BB	Res. Div. (tonnes) Exp. BB S-F+Other	Res. Div. (tonnes) Exp. BB M-F	Residential Diversion All Hhlds	Residential Waste Landfilled (by difference) 1992	Composition of Disposed Waste %
Total Residential Waste (tonnes)	1,077,245	732,030	345,215	226,850		389,542	128,399	517,942	559,303	
Paper										
Newspaper	188,501	120,328	68,173	63,951	82.40	99,151	56,174	155,325	33,176	6
Corrugated cardboard (OCC)	29,077	18,561	10,516	3,039	63.40	11,768	6,667	18,435	10,642	2
Telephone Directories	3,166	2,025	1,141	1,212	76.00	1,539	867	2,406	760	
Mixed paper	173,303	110,623	62,680	3,500	37.46	41,439	23,480	64,919	108,384	19
Subtotal (Paper)	394,048	251,538	142,510	71,702		153,897	87,189	241,085	152,962	27
Glass	56,149	35,843	20,307	26,183	74.50	26,703	15,129	41,831	14,318	3
Tinplate Steel (ferrous)	40,255	26,838	13,417	19,787	78.00	20,934	10,465	31,399	8,856	2
Aluminum (non-ferrous)	11,029	7,040	3,989	415	81.70	5,752	3,259	9,011	2,018	0
Plastic										
PET	1,003	640	363	697	83.40	534	302	836	166	
HDPE	50,133	32,002	18,131	1,252	57.40	18,369	10,407	28,777	21,357	
Other Plastic	13,035	8,321	4,714	0	22.00	1,831	1,037	2,868	10,167	
Subtotal (Plastic)	64,171	40,963	23,208	1,949		20,734	11,747	32,480	31,690	6
Organics										
Food wastes	252,672	161,291	91,380	19,992		55,230		55,230	197,441	
Yard waste	119,551	119,551	0	84,208		100,791		100,791	18,760	
Subtotal (Organics)	372,223	280,842	91,380	104,200		156,021	0	156,021	216,202	39
Wood Waste	9,024	5,760	3,264	0					9,024	
Construction/Demolition Waste	17,045	10,881	6,165	1,122		1,010	112	1,122	15,923	
Disposable Diapers	30,080	19,201	10,879	0					30,080	
Textiles/Leather/Rubber	46,123	29,442	16,681	0					46,123	
Other	37,099	23,682	13,417	4,992		4,493	499	4,992	32,107	
Subtotal (Wood - Other)	139,371	88,966	50,404	6,114		5,503	611	6,114	133,257	24
TOTAL	1,077,245	732,030	345,215	226,850		389,542	128,399	517,942	559,303	100

Residential Diversion = 48%
(Higher Estimate)

Notes:

1) Composition estimates based on East York data, from "Residential Waste Composition Study, Vol. I of the Ontario Waste Composition Study", Gore&Storrie, Jan/91 (excl. yard waste).

2) Yard Waste (generated) data from "The Physical and Economic Dimensions of Municipal Solid Waste in Ontario", CH2MHILL Engineering Ltd., Nov/91

3) White Goods (generated) estimate (included in Tinplate Steel total) from Gore & Storrie report listing in (1) above.

4) Diversion estimates from unpublished table and other tables in 1992 Metro Works Annual Report; personal communication with A. Nanda - Metro Works (June/93).

5) Expanded Blue Box is an add-on to the existing/committed system

6) Existing/committed assumes that 17,500 more backyard composters will be distributed

7) 80% of S-F, and 40% of Other Hhlds receive backyard composters, which divert 240 kg/composter/yr (68% food, 32% yard)

8) Expanded Blue Box assumes that the dry recyclables diverted by the Quinte program will be diverted at the Quinte capture rate in Durham

Table J.6
Expanded Blue Box System
(lower M-F and backyard composter diversion)
Metropolitan Toronto

Component	Residential Waste Generated (tonnes) 1992	Residential Waste Generated S-F+Other	Residential Waste Generated M-F	Res. Div. (tonnes) Existing/ Committed	Capture Rate (%) Exp. BB	Res. Div. (tonnes) Exp. BB S-F+Other	Res. Div. (tonnes) Exp. BB M-F	Residential Diversion All Hhlds	Residential Waste Landfilled (by difference) 1992	Composition of Disposed Waste %
Total Residential Waste (tonnes)	1,077,245	732,030	345,215	226,850		361,686	38,948	400,633	676,612	
Paper										
Newspaper	188,501	120,328	68,173	63,951	82.4	99,151	16,852	116,003	72,498	11
Corrugated cardboard (OCC)	29,077	18,561	10,516	3,039	63.4	11,768	2,000	13,768	15,309	2
Telephone Directories	3,166	2,025	1,141	1,212	76.0	1,539	260	1,799	1,367	
Mixed paper	173,303	110,623	62,680	3,500	37.4	41,489	7,044	48,483	124,8[illegible]	18
Subtotal (Paper)	394,048	251,538	142,510	71,702		153,9[illegible]	26,157	180,0[illegible]	213,9[illegible]	31
Glass	56,149	33,843	23,307	26,153	74.[illegible]	26,70[illegible]	[illegible]	31,2[illegible]	24,[illegible]	4
Tinplate Steel (ferrous)	40,255	26,838	13,417	19,787	78.0	20,934	3,140	24,073	16,182	2
Aluminum (non-ferrous)	11,029	7,040	3,989	415	85.7	5,752	978	6,7[illegible]	4,3[illegible]	1
Plastic										
PET	1,003	640	363	697	83.4	534	91	625	378	
HDPE	50,133	32,002	18,131	1,252	77.4	18,369	3,122	21,491	28,642	
Other Plastic	13,035	8,321	4,714	0	22.0	1,831	311	2,142	10,893	
Subtotal (Plastic)	64,171	40,963	23,208	1,949		20,734	3,524	24,258	39,913	6
Organics										
Food wastes	252,672	161,291	91,380	19,992		36,288		36,288	216,384	
Yard waste	119,551	119,551	0	84,208		91,877		91,877	27,674	
Subtotal (Organics)	372,223	280,842	91,380	104,200		128,164	0	128,164	244,0[illegible]	36
Wood Waste	9,024	5,760	3,264	0					9,024	
Construction/Demolition Waste	17,046	10,881	6,165	1,122		[illegible]	112	1,122	15,924	
Disposable Diapers	30,080	19,201	10,879	0					30,080	
Textiles/Leather/Rubber	46,123	29,442	16,681	0					46,123	
Other	37,099	23,682	13,417	4,992		4,493	499	4,992	32,107	
Subtotal (Wood - Other)	139,371	88,964	50,404	6,114		5,503	611	6,114	133,257	20
TOTAL	1,077,245	232,030	345,215	226,850		361,686	38,948	400,633	676,612	100

Residential Diversion = 37%
(Lower estimate)

Notes

1) [illegible] estimates from unpublished table and other tables in 1992 Metro Works Annual Report, personal communication with A. Nanda, Metro Works (June 199[illegible])

2) Expanded Blue Box is an addition to the existing/committed system

3) [illegible]

4) The scenario assumes that [illegible] Quinte capture rates [illegible] households divert at the Quinte capture rate

5) Existing/committed assumes that [illegible] backyard composters will be distributed

6) White goods are [illegible]

7) Other category includes HHW, [illegible]

Table J.7
Wet/Dry System
(higher diversion estimate)
Metropolitan Toronto

Component	Residential Waste Generated (tonnes) 1,992	Residential Waste Generated S-F+Other	Residential Waste Generated M-F	Res. Div. (tonnes) Existing/ Committed	Capture Rate (%) Exp. BB	Res. Div. (tonnes) Exp. BB S-F+Other	Res. Div. (tonnes) Exp. BB M-F	Residential Diversion All Hhlds	Residential Waste Landfilled (by difference) 1992	Composition of Disposed Waste %
Total Residential Waste (tonnes)	1,077,245	732,030	345,215	226,850		463,345	201,504	664,849	412,396	
Paper										
Newspaper	188,501	120,328	68,173	63,951	82.40	99,151	56,174	155,325	33,176	8
Corrugated cardboard (OCC)	29,077	18,561	10,516	3,039	63.40	11,768	6,667	18,435	10,642	3
Telephone Directories	3,166	2,025	1,141	1,212	76.00	1,539	867	2,406	760	
Mixed paper	173,303	110,623	62,680	3,500	37.46	41,439	23,480	64,919	108,384	26
Subtotal (Paper)	394,048	251,538	142,510	71,702		153,897	87,189	241,085	152,962	37
Glass	56,149	35,843	20,307	26,183	74.50	26,703	15,129	41,831	14,318	3
Tinplate Steel (ferrous)	40,255	26,838	13,417	19,787	78.00	20,934	10,465	31,399	8,856	2
Aluminum (non-ferrous)	11,029	7,040	3,989	415	81.70	5,752	3,259	9,011	2,018	0
Plastic										
PET	1,003	640	363	697	83.40	534	302	836	166	
HDPE	50,133	32,002	18,131	1,252	57.40	18,369	10,407	28,777	21,357	
Other Plastic	13,035	8,321	4,714	0	22.00	1,831	1,037	2,868	10,167	
Subtotal (Plastic)	64,171	40,963	23,208	1,949		20,734	11,747	32,480	31,690	8
Organics										
Food wastes	252,672	161,291	91,380	19,992		129,033	73,104	202,137	50,534	
Yard waste	119,551	119,551	0	84,208		100,791		100,791	18,760	
Subtotal (Organics)	372,223	280,842	91,380	104,200		229,824	73,104	302,928	69,295	17
Wood Waste	9,024	5,760	3,264	0					9,024	
Construction/Demolition Waste	17,045	10,881	6,165	1,122		1,010	112	1,122	15,923	
Disposable Diapers	30,080	19,201	10,879	0					30,0[illegible]	
Textiles/Leather/Rubber	46,123	29,442	16,681	0					46,123	
Other	37,099	23,682	13,417	4,992		4,493	499	4,992	32,107	
Subtotal (Wood - Other)	139,371	88,966	50,404	6,114		5,503	611	6,114	133,257	32
TOTAL	**1,077,245**	**732,030**	**345,215**	**226,850**		**463,345**	**201,504**	**664,849**	**412,396**	**100**

Residential Diversion = 62%
(higher estimate)

Notes:

1) Composition estimates based on East York data, from "Residential Waste Composition Study, Vol. I of the Ontario Waste Composition Study", Gore&Storrie, Jan/91 (excl. yard waste).

2) Yard Waste (generated) data from "The Physical and Economic Dimensions of Municipal Solid Waste in Ontario", CH2MHILL Engineering Ltd., Nov/91

3) White Goods (generated) estimate (included in Tinplate Steel total) from Gore & Storrie report listing in (1) above.

4) Diversion estimates from unpublished table and other tables in 1992 Metro Works Annual Report, personal communication with A. Nanda - Metro Works (June/93)

5) 80% of S-F, and 40% of Other Hhlds receive backyard composters, which divert 240 kg/composter/yr (68% food, 32% yard)

6) Dry recyclables are assumed to be diverted at the same rate as Expanded Blue Box (i.e. Quinte capture rates and materials)

7) 80% of Organics (food and yard) will be diverted through curbside collection plus backyard composting

Table J.8
Wet/Dry System
(lower backyard composter diversion)
Metropolitan Toronto

Component	Residential Waste Generated (tonnes) 1,992	Residential Waste Generated S-F+Other	Residential Waste Generated M-F	Res. Div. (tonnes) Existing/ Committed	Capture Rate (%) Exp. BB	Res. Div. (tonnes) Exp. BB S-F+Other	Res. Div. (tonnes) Exp. BB M-F	Residential Diversion All Hhlds	Residential Waste Landfilled (by difference) 1992	Composition of Disposed Waste %
Total Residential Waste (tonnes)	1,077,245	732,030	345,215	226,850	#	458,195	66,362	524,557	552,688	
Paper										
Newspaper	188,501	120,328	68,173	63,951	82.40	99,151	16,852	116,003	72,498	13
Corrugated cardboard (OCC)	29,077	18,561	10,516	3,039	63.40	11,768	2,000	13,768	15,309	3
Telephone Directories	3,166	2,025	1,141	1,212	76.00	1,539	260	1,799	1,367	
Mixed paper	173,303	110,623	62,680	3,600	37.46	41,439	7,044	48,483	124,820	23
Subtotal (Paper)	394,048	251,538	142,510	71,702		153,897	26,157	180,053	213,994	38
Glass	56,149	35,843	20,307	26,183	74.50	26,703	4,539	31,241	24,908	5
Tinplate Steel (ferrous)	40,255	26,838	13,417	19,787	78.00	20,934	3,140	24,073	16,182	3
Aluminum (non-ferrous)	11,029	7,040	3,989	415	81.70	5,752	978	6,730	4,300	1
Plastic										
PET	1,003	640	363	697	83.40	534	91	625	378	
HDPE	50,133	32,002	18,131	1,252	57.40	18,369	3,122	21,491	28,642	
Other Plastic	13,035	8,321	4,714	0	22.00	1,831	311	2,142	10,893	
Subtotal (Plastic)	64,171	40,963	23,208	1,949		20,734	3,524	24,258	39,913	7
Organics										
Food wastes	252,672	161,291	91,380	19,992		129,033	27,414	156,447	96,225	
Yard waste	119,551	119,551	0	84,208		95,641		95,641	23,910	
Subtotal (Organics)	372,223	280,842	91,380	104,200		224,674	27,414	252,088	120,135	22
Wood Waste	9,024	5,760	3,264	0					9,024	
Construction/Demolition Waste	17,045	10,881	6,165	1,122		1,010	112	1,122	15,923	
Disposable Diapers	30,080	19,201	10,879	0					30,080	
Textiles/Leather/Rubber	46,123	29,442	16,681	0					46,123	
Other	37,099	23,682	13,417	4,992		4,493	499	4,992	32,107	
Subtotal (Wood - Other)	139,371	88,966	50,404	6,114		5,503	611	6,114	133,257	24
TOTAL	1,077,245	732,030	345,215	226,850		458,195	66,362	524,557	552,688	100

Residential Diversion = 49%
(lower estimate)

Notes:

1) Composition estimates based on East York data, from "Residential Waste Composition Study, Vol. I of the Ontario Waste Composition Study", Gore&Storrie, Jan/91 (excl. yard waste)

2) Yard Waste (generated) data from "The Physical and Economic Dimensions of Municipal Solid Waste in Ontario", CH2MHILL Engineering Ltd., Nov/91

3) White Goods (generated) estimate (included in 'Tinplate Steel' total) from Gore & Storrie report listing in (1) above

4) Diversion estimates from unpublished table and other tables in 1992 Metro Works Annual Report, personal communication with A. Nanda - Metro Works (June/93)

5) [illegible] backyard composters [illegible] divert 240 kg/comp/yr [illegible] divert 100 kg/comp/yr (68% food, 32% yard)

6) [illegible]

7) [illegible]

8) [illegible]

Table J.9

Mixed Waste Processing System
plus Backyard Composting to Saturation
Metropolitan Toronto

Component	Residential Waste Generated (tonnes)	Res. Diversion (tonnes) Exist/Comm + B.Y. Compos.	Residential Waste Landfilled (tonnes)	Recovered for Recycling in MSW Processing	MSW plus E/C Diversion (tonnes)	Recovered for Composting in MSW Processing	MSW plus E/C plus Composting (landfilled)	MSW plus E/C plus Composting (marketed)	Residue to Landfill from MSW Processing
Total Residential Waste (tonnes)	1,077,245	282,171	795,074						
Paper									
Newspaper	188,501	63,951	124,550	37,365	101,316	74,107	138,370	175,423	13,078
Corrugated cardboard (OCC)	29,077	3,039	26,038	13,019	16,058	11,066	21,591	27,124	1,953
Telephone Directories	3,166	1,212	1,954	977	2,189	830	2,604	3,019	147
Mixed paper	173,303	3,500	169,803	16,980	20,480	129,900	85,430	150,380	22,923
Subtotal (Paper)	394,048	71,702	322,346	68,341	140,043	215,904	247,995	355,947	38,101
Glass	56,149	26,183	29,966	5,993	32,176	0	32,176	32,176	23,973
Tinplate Steel (ferrous)	40,255	19,787	20,468	14,328	34,115	0	34,115	34,115	6,140
Aluminum (non-ferrous)	11,029	415	10,614	5,307	5,722	0	5,722	5,722	5,307
Plastic									
PET	1,003	697	306	306	1,003	0	1,003	1,003	0
HDPE	50,133	1,252	48,881	12,220	13,472	0	13,472	13,472	36,661
Other Plastic	13,035	0	13,035	0	0	0	0	0	13,035
Subtotal (Plastic)	64,171	1,949	62,222	12,526	14,475	0	14,475	14,475	49,696
Organics									
Food wastes	252,672	55,230	197,441	0	55,230	167,825	139,143	223,056	29,616
Yard waste	119,551	100,791	18,760	0	100,791	16,884	109,233	117,675	1,876
Subtotal (Organics)	372,223	156,021	216,202	0	156,021	184,709	248,376	340,730	31,492
Wood Waste	9,024	0	9,024	0	0	902	451	902	8,122
Construction/Demolition Waste	17,045	1,122	15,923	0	1,122	1,592	1,918	2,714	14,331
Disposable Diapers	30,080	0	30,080	0	0	0	0	0	30,080
Textiles/Leather/Rubber	46,123	0	46,123	4,612	4,612	0	4,612	4,612	41,510
Other	37,099	4,992	32,107	0	4,992	0	4,992	4,992	32,107
Subtotal (Wood - Other)	139,371	6,114	133,257	4,612	10,726	2,495	11,974	13,221	126,150
TOTAL	1,077,245	282,171	795,074	111,108	393,279	403,108	594,833	796,386	280,859
	Diversion =	26%			37%		55%	74%	
							(compost landfilled) (higher estimate)	(compost marketed)	

Notes:

2) This analysis assumes that there were 288,275 S-F hhlds, 269,502 Other hhlds, and 314,385 multi-family hhlds in 1992

3) Composition estimates based on East York data from "Residential Waste Composition Study, Vol. I of the Ontario Waste Comp. Study", Gore & Storrie Ltd., Jan/91 (excl. yard waste)

4) Yard Waste (comp. generated) data from "The Physical and Economic Dimensions of Municipal Solid Waste in Ontario", CH2M Hill Eng. Ltd., Nov/91

5) White Goods (comp. generated) estimate (included in Tinplate Steel total) from "Residential Waste Comp. Study, Vol. I of the Ontario Waste Comp. Study", G.& S Ltd., [illegible]

6) 80% of S-F, 40% of Other Households receive backyard composters, which divert 240 kg/year (68% food, 32% yard)

Table J.10
Mixed Waste Processing System
(lower backyard composter diversion)
Metropolitan Toronto

Component	Residential Waste Generated (tonnes)	Res. Diversion (tonnes) Exist/Comm + B.Y. Compos.	Residential Waste Landfilled (tonnes)	Recovered for Recycling in MSW Processing	MSW plus E/C Diversion (tonnes)	Recovered for Composting in MSW Processing	MSW plus E/C plus Composting (landfilled)	MSW plus E/C plus Composting (marketed)	Residue to Landfill from MSW Processing
Total Residential Waste (tonnes)	1,077,245	254,314	822,931						
Paper									
Newspaper	188,501	63,951	124,550	37,365	101,316	74,107	138,370	175,423	13,078
Corrugated cardboard (OCC)	29,077	3,039	26,038	13,019	16,058	11,066	21,591	27,124	1,933
Telephone Directories	3,166	1,212	1,954	977	2,189	830	2,604	3,019	147
Mixed paper	173,303	3,500	169,803	16,980	20,480	129,900	85,430	150,380	22,923
Subtotal (Paper)	394,048	71,702	322,346	68,341	140,043	215,904	247,995	[illegible]	[illegible]
Glass	36,149	2,187	29,966	5,993	32,176	0	32,176	32,176	[illegible]
Tin plate steel (ferrous)	40,255	19,787	20,468	14,328	34,115	0	34,115	34,115	6,[illegible]
Aluminum (non-ferrous)	11,029	415	10,614	5,307	5,722	0	5,722	5,722	5,307
Plastic									
PET	1,003	697	306	306	1,003	0	1,003	1,003	0
HDPE	50,133	1,252	48,881	12,220	13,472	0	13,472	13,472	[illegible]
Other Plastic	13,035	0	13,035	0	0	0	0	0	[illegible]
Subtotal (Plastic)	64,171	1,949	62,222	12,526	14,475	0	14,475	14,475	[illegible]
Organics									
Food waste	252,672	36,288	216,384	0	36,288	183,926	128,251	220,214	[illegible]
Yard waste	119,551	91,877	27,674	0	91,877	24,907	104,330	116,784	[illegible]
Subtotal (Organics)	372,223	128,164	244,058	0	128,164	208,833	232,581	[illegible]	[illegible]
Wood Waste	9,024	0	9,024	0	0	902	451	902	8,122
Construction/Demolition Waste	17,045	1,122	15,923	0	1,122	1,592	1,918	2,714	14,331
Disposable Diapers	30,080	0	30,080	0	0	0	0	0	30,080
Textiles/Leather/Rubber	46,123	0	46,123	4,612	4,612	0	4,612	4,612	41,510
Other	37,099	4,992	32,107	0	4,992	0	4,992	4,992	32,107
Subtotal (Wood - Other)	139,371	6,114	133,257	4,612	10,726	2,495	11,974	[illegible]	126,150
TOTAL	1,077,245	254,314	822,931	111,108	365,422	427,232	579,038	792,654	284,591
Residential Diversion =		24%			34%		54% (compost landfilled) (lower estimate)	74% (compost marketed)	

Notes

1) [illegible]

2) [illegible]

3) [illegible]

4) [illegible]

5) [illegible]

SCHEDULE K

REGION OF YORK ESTIMATES

Region of York, 1992

Component	Residential Waste Generated (tonnes) All Households	Residential Waste Generated S-F+Other	Residential Waste Generated M-F	Residential Diversion (tonnes) 1992	Residential Waste Landfilled (by difference) 1992	Composition of Disposed Waste %
Total Residential Waste (tonnes)	198,313	179,158	19,155	56,163	142,150	
Paper						
Newspaper	33,232	29,449	3,783	16,641	16,591	12
Corrugated cardboard (OCC)	5,126	4,543	584	677	4,449	3
Telephone Directories	367	325	42	75	291	0
Mixed paper	30,744	27,245	3,500	69	30,676	22
Subtotal (Paper)	69,469	61,562	7,908	17,462	52,007	37
Glass	9,899	8,772	1,127	5,770	4,129	3
Tinplate Steel (ferrous)	7,313	6,568	744	2,796	4,517	3
Aluminum (non-ferrous)	1,944	1,723	221	91	1,854	1
Plastic						
PET	291	271	20	282	9	0
HDPE	8,838	7,832	1,006	404	8,434	6
Other Plastic	2,183	1,922	262		2,183	2
Subtotal (Plastic)	11,312	10,025	1,288	686	10,627	7
Organics						
Food wastes	44,545	39,475	5,071	4,741	39,804	28
Yard waste	29,259	29,259	0	18,531	10,728	8
Subtotal (Organics)	73,804	68,734	5,071	23,272	50,532	36
Wood Waste	1,591	1,410	181		1,591	1
Construction/Demolition Waste	3,005	2,663	342		3,005	2
Disposable Diapers	5,303	4,699	604		5,303	4
Textiles/Leather/Rubber	8,131	7,206	926	61	8,070	6
Other	6,540	5,796	744	6,025	515	0
Subtotal (Wood - Other)	24,571	21,774	2,797	6,087	18,484	13
TOTAL	198,313	179,157	19,155	56,163	142,150	100

Residential Diversion = 28%

Notes:

1) Composition estimates based on East York data, from "Residential Waste Composition Study, Vol. I of the Ontario Waste Composition Study", Gore&Storrie, Jan/91 (excl. yard waste)
2) Yard Waste (generated) data from "The Physical and Economic Dimensions of Municipal Solid Waste in Ontario", CH2MHILL Engineering Ltd., Nov/91
3) White Goods (generated) estimate (included in Tinplate Steel total) from Gore & Storrie report listing in (1) above.
4) Diversion estimates provided by Markham, Richmond Hill and Region of York.
5) Other category includes recycled materials declared from York Region at Keele Valley Landfill
6) Percentage of PET generated increased to agree with amount diverted; percentage of other plastics generated lowered proportionally

Table K.2
Existing/Committed System
Region of York

Component	Residential Waste Generated (tonnes) All Households	Residential Waste Generated S-F+Other	Residential Waste Generated M-F	Residential Diversion (tonnes) 1992	Additional Diversion Existing/ Committed	Residential Waste Landfilled (by difference) 1992	Composition of Disposed Waste %
Total Residential Waste (tonnes)	198,313	179,158	19,155	56,163	0	142,150	
Paper							
Newspaper	33,232	29,449	3,783	16,641		16,591	12
Corrugated cardboard (OCC)	5,126	4,543	584	677		4,449	3
Telephone Directories	367	325	42	75		291	0
Mixed paper	30,744	27,245	3,500	69		30,676	22
Subtotal (Paper)	69,469	61,562	7,908	17,462		52,007	37
Glass	9,899	8,772	1,127	5,770		4,129	3
Tinplate Steel (ferrous)	7,313	6,568	744	2,796		4,517	3
Aluminum (non-ferrous)	1,944	1,723	221	91		1,854	1
Plastic							
PET	291	271	20	282		9	0
HDPE	8,838	7,832	1,006	404		8,434	6
Other Plastic	2,183	1,922	262			2,183	2
Subtotal (Plastic)	11,312	10,025	1,288	686		10,627	7
Organics							
Food wastes	44,545	39,475	5,071	4,741		39,804	28
Yard waste	29,259	29,259	0	18,531		10,728	8
Subtotal (Organics)	73,804	68,734	5,071	23,272		50,532	36
Wood Waste	1,591	1,410	181			1,591	1
Construction/Demolition Waste	3,005	2,663	342			3,005	2
Disposable Diapers	5,303	4,699	604			5,303	4
Textiles/Leather/Rubber	8,131	7,206	926	61		8,070	6
Other	6,540	5,796	744	6,025		515	0
Subtotal (Wood - Other)	24,571	21,774	2,797	6,087		18,484	13
TOTAL	198,313	179,157	19,155	56,163	0	142,150	100

Residential Diversion = 28%

Notes:

1) The existing/committed system in York is the same as the existing system, therefore the same assumption apply.

2) Composition estimates based on East York data from "Residential Waste Composition Study, Vol. 1 of the Ontario Waste Composition Study", Gore&Storrie, Jan/91 (excl. yard waste)

3) Yard Waste (generated) data from "The Physical and Economic Dimensions of Municipal Solid Waste in Ontario", CH2MHILL Engineering Ltd., Nov '91

4) White Goods (generated) estimate [illegible] Tinplate Steel totals from Gore & Storrie report [illegible] in 1) above

5) Diversion estimates provided by Markham, Richmond Hill and Region of York

6) Other category [illegible] York Region at Keele Valley Landfill

7) [illegible]

Direct Cost
(higher diversion estimate)
Region of York

Component	Residential Waste Generated (tonnes) All Households	Residential Waste Generated S-F+Other	Residential Waste Generated M-F	Existing Residential Diversion (tonnes)	Quinte Capture Rates (%)	Total Residential Diversion (tonnes)	Residential Waste Landfilled (by difference) 1992	Composition of Disposed Waste %
Total Residential Waste (tonnes)	198,313	179,158	19,155	56,163		99,396	98,917	
Paper								
Newspaper	33,232	29,449	3,783	16,641	82	27,383	5,849	6
Corrugated cardboard (OCC)	5,126	4,543	584	677	63	3,250	1,876	2
Telephone Directories	367	325	42	75	76	279	88	0
Mixed paper	30,744	27,245	3,500	69		69	30,676	31
Subtotal (Paper)	69,469	61,562	7,908	17,462		30,981	38,489	39
Glass	9,899	8,772	1,127	5,770	75	7,375	2,524	3
Tinplate Steel (ferrous)	7,313	6,568	744	2,796	78	5,704	1,609	2
Aluminum (non-ferrous)	1,944	1,723	221	91	82	1,589	356	0
Plastic								
PET	291	271	20	282	83	242	48	0
HDPE	8,838	7,832	1,006	404	57	5,073	3,765	4
Other Plastic	2,183	1,922	262				2,183	2
Subtotal (Plastic)	11,312	10,025	1,288	686		5,316	5,997	6
Organics								
Food wastes	44,545	39,475	5,071	4,741		17,711	26,834	27
Yard waste	29,259	29,259	0	18,531		24,635	4,624	5
Subtotal (Organics)	73,804	68,734	5,071	23,272		42,346	31,458	32
Wood Waste	1,591	1,410	181				1,591	2
Construction/Demolition Waste	3,005	2,663	342				3,005	3
Disposable Diapers	5,303	4,699	604				5,303	5
Textiles/Leather/Rubber	8,131	7,206	926	61		61	8,070	8
Other	6,540	5,796	744	6,025		6,025	515	1
Subtotal (Wood - Other)	24,571	21,774	2,797	6,087		6,087	18,484	19
TOTAL	198,313	179,157	19,155	56,163		99,396	98,917	100

Residential Diversion = 50%
(higher estimate)

Notes:
1) Composition estimates based on East York data, from "Residential Waste Composition Study, Vol. I of the Ontario Waste Composition Study", Gore&Storrie, Jan/91 (excl. yard waste)
2) Yard Waste (generated) data from "The Physical and Economic Dimensions of Municipal Solid Waste in Ontario", CH2MHILL Engineering Ltd., Nov/91
3) Diversion estimates provided by Markham, Richmond Hill and Region of York
4) User Pay is an add-on to the existing/committed system
5) User Pay assumes that diversion of existing dry recyclables will reach Quinte capture rates
6) User pay system assumes 80% of S-F, 40% of Other Hhlds receive backyard composters, which divert 240kg/composter/yr, 68% food, 32% yard
7) Assumes 80% of yard waste diverted by curbside plus backyard composters (in this case, more than 80% is diverted)

Table K.4
Direct Cost System
(lower M-F and backyard composter diversion)
Region of York

Component	Residential Waste Generated (tonnes) All Households	Residential Waste Generated S-F+Other	Residential Waste Generated M-F	Existing Residential Diversion (tonnes)	Quinte Capture Rates (%)	Direct Cost Diversion S-F+Other (tonnes)	Direct Cost Diversion M-F (tonnes)	Total Residential Diversion (tonnes)	Residential Waste Landfilled (tonnes)	Disposed Waste Comp. %
Total Residential Waste (tonnes)	198,313	179,158	19,155	56,163				87,247	111,067	
Paper										
Newspaper	33,232	29,449	3,783	16,641	82	24,266	935	25,201	8,031	7
Corrugated cardboard (OCC)	5,126	4,543	584	677	63	2,880	111	2,991	2,135	2
Telephone Directories	367	325	42	75	76	247	9	256	110	0
Mixed paper	30,744	27,245	3,500	69		62	7	69	30,676	28
Subtotal (Paper)	69,469	61,562	7,908	17,462		27,455	1,062	28,518	40,952	37
Glass	9,899	8,772	1,127	5,770	75	6,535	252	6,787	3,112	3
Tinplate Steel (ferrous)	7,313	6,568	744	2,796	78	5,123	174	5,298	2,015	2
Aluminum (non-ferrous)	1,944	1,723	221	91	82	1,408	34	1,442	482	0
Plastic										
PET	291	271	20	282	83	226	5	231	60	0
HDPE	8,838	7,832	1,006	404	57	4,496	173	4,669	4,169	4
Other Plastic	2,183	1,922	262						2,183	2
Subtotal (Plastic)	11,312	10,025	1,288	686		4,721	178	4,900	6,412	6
Organics										
Food wastes	44,545	39,475	5,071	4,741		10,789		10,789	33,756	30
Yard waste	29,259	29,259	0	18,531		23,407		23,407	5,852	5
Subtotal (Organics)	73,804	68,734	5,071	23,272		34,196	0	34,196	39,608	36
Wood Waste	1,591	1,410	181			0	0	0	1,591	1
Construction/Demolition Waste	3,005	2,663	342			0	0	0	3,005	3
Disposable Diapers	5,303	4,699	604			0	0	0	5,303	5
Textiles/Leather/Rubber	8,131	7,206	926	61		55	6	61	8,070	7
Other	6,540	5,796	744	6,025		5,423	603	6,025	515	0
Subtotal (Wood - Other)	24,571	21,774	2,797	6,087		5,478	609	6,087	18,484	17
TOTAL	198,313	179,157	19,155	56,163		84,917	2,330	87,247	111,066	100

Residential Diversion = 44%
(lower estimate)

Notes

1) Composition estimate based on [illegible] data from "Residential Waste Composition Study, Vol. I of the Ontario Waste Composition Study". [illegible]

2) [illegible]

3) [illegible] Quinte capture rates.

4) [illegible] Quinte capture rate.

5) [illegible]

[illegible] backyard composters.

Expanded Blue Box System
(higher diversion estimate)
Region of York

Component	Residential Waste Generated (tonnes) All Households	Residential Waste Generated S-F+Other	Residential Waste Generated M-F	Existing Residential Diversion (tonnes)	Quinte Capture Rates (%)	Total Residential Diversion (tonnes)	Residential Waste Landfilled (by difference) 1992	Composition of Disposed Waste %
Total Residential Waste (tonnes)	198,313	179,158	19,155	56,163		111,325	86,989	
Paper								
Newspaper	33,232	29,449	3,783	16,641	82	27,383	5,849	7
Corrugated cardboard (OCC)	5,126	4,543	584	677	63	3,250	1,876	2
Telephone Directories	367	325	42	75	76	279	88	0
Mixed paper	30,744	27,245	3,500	69	37	11,517	19,228	22
Subtotal (Paper)	69,469	61,562	7,908	17,462		42,429	27,041	31
Glass	9,899	8,772	1,127	5,770	75	7,375	2,524	3
Tinplate Steel (ferrous)	7,313	6,568	744	2,796	78	5,704	1,609	2
Aluminum (non-ferrous)	1,944	1,723	221	91	82	1,589	356	0
Plastic								
PET	291	271	20	282	83	242	48	0
HDPE	8,838	7,832	1,006	404	57	5,073	3,765	4
Other Plastic	2,183	1,922	262		22	480	1,703	2
Subtotal (Plastic)	11,312	10,025	1,288	686		5,796	5,516	6
Organics								
Food wastes	44,545	39,475	5,071	4,741		17,711	26,834	31
Yard waste	29,259	29,259	0	18,531		24,635	4,624	5
Subtotal (Organics)	73,804	68,734	5,071	23,272		42,346	31,458	36
Wood Waste	1,591	1,410	181				1,591	2
Construction/Demolition Waste	3,005	2,663	342				3,005	3
Disposable Diapers	5,303	4,699	604				5,303	6
Textiles/Leather/Rubber	8,131	7,206	926	61		61	8,070	9
Other	6,540	5,796	744	6,025		6,025	515	1
Subtotal (Wood - Other)	24,571	21,774	2,797	6,087		6,087	18,484	21
TOTAL	198,313	179,157	19,155	56,163		111,325	86,988	100

Residential Diversion = 56%
(Higher Estimate)

Notes:

1) Composition estimates based on East York data, from "Residential Waste Composition Study, Vol. I of the Ontario Waste Composition Study", Gore&Storrie, Jan/91 (excl. yard waste)

2) Yard Waste (generated) data from "The Physical and Economic Dimensions of Municipal Solid Waste in Ontario", CH2MHILL Engineering Ltd., Nov/91

3) White Goods (generated) estimate (included in Tinplate Steel total) from Gore & Storrie report listing in (1) above

4) Diversion estimates provided by Markham, Richmond Hill and Region of York

5) Assume 80% of S-F, 40% of Other Hhlds receive backyard composters, which divert 240kg/composter/yr (68% food, 32% yard)

6) Expanded Blue Box materials and capture rates are taken from Quinte Blue Box 2000 program

Table K.6
Expanded Blue Box System
(lower M-F and backyard composter diversion)
Region of York

Component	Residential Waste Generated (tonnes) All Households	Residential Waste Generated S-F+Other	Residential Waste Generated M-F	Existing Residential Diversion (tonnes)	Quinte Capture Rates (%)	Exp. BB Diversion S-F+Other (tonnes)	Exp. BB Diversion M-F (tonnes)	Total Residential Diversion (tonnes)	Residential Waste Landfilled (by difference) 1992	Composition of Disposed Waste %
Total Residential Waste (tonnes)	198,313	179,158	19,155	56,163				96,187	102,126	
Paper										
Newspaper	33,232	29,449	3,783	16,641	82	24,266	935	25,201	8,031	8
Corrugated cardboard (OCC)	5,126	4,543	584	677	63	2,880	111	2,991	2,135	2
Telephone Directories	367	325	42	75	76	247	9	256	110	0
Mixed paper	30,744	27,245	3,500	69	37	10,206	393	10,599	20,145	20
Subtotal (Paper)	69,469	61,562	7,908	17,462		37,599	1,449	39,048	30,421	30
Glass	9,899	8,772	1,127	5,770	75	6,535	252	6,787	3,112	3
Tinplate Steel (ferrous)	7,313	6,568	744	2,796	78	5,123	174	5,298	2,015	2
Aluminum (non-ferrous)	1,944	1,723	221	91	82	1,408	54	1,462	482	0
Plastic										
PET	291	271	20	282	83	226	5	231	60	0
HDPE	8,838	7,832	1,006	404	57	4,496	173	4,669	4,169	4
Other Plastic	2,183	1,922	262		22	423	17	440	1,743	2
Subtotal (Plastic)	11,312	10,025	1,288	686		5,144	196	5,340	5,973	6
Organics										
Food wastes	44,545	39,475	5,071	4,741		10,789		10,789	33,756	33
Yard waste	29,259	29,259	0	18,531		21,377		21,377	7,882	8
Subtotal (Organics)	73,804	68,734	5,071	23,272		32,166	0	32,166	41,638	41
Wood Waste	1,591	1,410	181			0	0	0	1,591	2
Construction/Demolition Waste	3,005	2,663	342			0	0	0	3,005	3
Disposable Diapers	5,303	4,699	604			0	0	0	5,303	5
Textiles/Leather/Rubber	8,131	7,206	926	61		55	6	61	8,070	8
Other	6,540	5,796	744	6,025		5,423	603	6,025	515	1
Subtotal (Wood - Other)	24,571	21,774	2,797	6,087		5,478	609	6,087	18,484	18
TOTAL	**198,313**	**179,157**	**19,155**	**56,163**		**93,454**	**2,733**	**96,187**	**102,125**	**100**

Residential Diversion = 49%
(lower estimate)

Notes

1) Composition estimates based on East York data from "Residential Waste Composition Study, Vol. I of the Ontario Waste Composition Study", Gore&Storrie, Jan/91 (excl. yard waste)
2) Yard Waste generated: data from "The Physical and Economic Dimensions of Municipal Solid Waste in Ontario", CH2MHILL Engineering Ltd., Nov/91
3) White Goods (processed) estimate included in Tinplate Steel total from Gore & Storrie report listing in (1) above
4) This scenario assumes that M-F [illegible] at [illegible] of the Quinte capture rate
5) Assume [illegible] of [illegible] households divert 240 kg/comp/yr; the remainder divert 100 kg/comp/yr (68% food, 32% yard)
6) Expanded Blue Box materials and capture rates are taken from Quinte Blue Box 2000 program

Wet/Dry System
(higher diversion estimate)
Region of York

Component	Residential Waste Generated (tonnes) All Households	Residential Waste Generated S-F+Other	Residential Waste Generated M-F	Existing Residential Diversion (tonnes)	Quinte Capture Rates (%)	Total Residential Diversion (tonnes)	Residential Waste Landfilled (by difference) 1992	Composition of Disposed Waste %
Total Residential Waste (tonnes)	198,313	179,158	19,155	56,163		129,250	69,064	
Paper								
Newspaper	33,232	29,449	3,783	16,641	82	27,383	5,849	8
Corrugated cardboard (OCC)	5,126	4,543	584	677	63	3,250	1,876	3
Telephone Directories	367	325	42	75	76	279	88	0
Mixed paper	30,744	27,245	3,500	69	37	11,517	19,228	28
Subtotal (Paper)	69,469	61,562	7,908	17,462		42,429	27,041	39
Glass	9,899	8,772	1,127	5,770	75	7,375	2,524	4
Tinplate Steel (ferrous)	7,313	6,568	744	2,796	78	5,704	1,609	2
Aluminum (non-ferrous)	1,944	1,723	221	91	82	1,589	356	1
Plastic								
PET	291	271	20	282	83	242	48	0
HDPE	8,838	7,832	1,006	404	57	5,073	3,765	5
Other Plastic	2,183	1,922	262		22	480	1,703	2
Subtotal (Plastic)	11,312	10,025	1,288	686		5,796	5,516	8
Organics								
Food wastes	44,545	39,475	5,071	4,741		35,636	8,909	13
Yard waste	29,259	29,259	0	18,531		24,635	4,624	7
Subtotal (Organics)	73,804	68,734	5,071	23,272		60,271	13,533	20
Wood Waste	1,591	1,410	181				1,591	2
Construction/Demolition Waste	3,005	2,663	342				3,005	4
Disposable Diapers	5,303	4,699	604				5,303	8
Textiles/Leather/Rubber	8,131	7,206	926	61		61	8,070	12
Other	6,540	5,796	744	6,025		6,025	515	1
Subtotal (Wood - Other)	24,571	21,774	2,797	6,087		6,087	18,484	27
TOTAL	198,313	179,157	19,155	56,163		129,250	69,063	100

Residential Diversion = 65%
(higher estimate)

Notes:
1) Composition estimates based on East York data, from "Residential Waste Composition Study, Vol. I of the Ontario Waste Composition Study", Gore&Storne, Jan/91 (excl. yard waste).
2) Yard Waste (generated) data from "The Physical and Economic Dimensions of Municipal Solid Waste in Ontario", CH2MHILL Engineering Ltd., Nov/91
3) White Goods (generated) estimate (included in Tinplate Steel total) from Gore & Storne report listing in (1) above
4) Diversion estimates provided by Markham, Richmond Hill and Region of York.
5) Assume 80% of S-F, 40% of Other Hhlds receive backyard composters, which divert 240kg/composter/yr (68% food, 32% yard)
6) Expanded Blue Box materials and capture rates are taken from Quinte Blue Box 2000 program
7) Wet/Dry assumes that at least 80% of food and yard waste is diverted (by curbside + backyard composter)

Table K.8
Wet/Dry System
(lower M-F and backyard composter diversion)
Region of York

Component	Residential Waste Generated (tonnes) All Households	Residential Waste Generated S-F+Other	Residential Waste Generated M-F	Existing Residential Diversion (tonnes)	Quinte Capture Rates (%)	Wet/Dry Diversion S-F+Other (tonnes)	Wet/Dry Diversion M-F (tonnes)	Total Residential Diversion (tonnes)	Residential Waste Landfilled (tonnes)	Disposed Waste Comp. %
Total Residential Waste (tonnes)	198,313	179,158	19,155	56,163				120,529	77,784	
Paper										
Newspaper	33,232	29,449	3,783	16,641	82	24,266	935	25,201	8,031	10
Corrugated cardboard (OCC)	5,126	4,543	584	677	63	2,880	111	2,991	2,135	3
Telephone Directories	367	325	42	75	76	247	9	256	110	0
Mixed paper	30,744	27,245	3,500	69	37	10,206	393	10,599	20,145	26
Subtotal (Paper)	69,469	61,562	7,908	17,462		37,599	1,449	39,048	30,421	39
Glass	9,899	8,772	1,127	5,770	75	6,535	252	6,787	3,112	4
Tinplate Steel (ferrous)	7,313	6,568	744	2,796	78	5,123	174	5,298	2,015	3
Aluminum (non-ferrous)	1,944	1,723	221	91	82	1,408	54	1,462	482	1
Plastic										
PET	291	271	20	282	83	226	5	231	60	0
HDPE	8,838	7,832	1,006	404	57	4,496	173	4,669	4,169	5
Other Plastic	2,183	1,922	262		22	423	17	440	1,743	2
Subtotal (Plastic)	11,312	10,025	1,288	686		5,144	196	5,340	5,973	8
Organics										
Food wastes	44,545	39,475	5,071	4,741		31,580	1,521	33,101	11,444	15
Yard waste	29,259	29,259	0	18,531		23,407		23,407	5,852	8
Subtotal (Organics)	73,804	68,734	5,071	23,272		54,987	1,521	56,508	17,296	22
Wood Waste	1,591	1,410	181						1,591	2
Construction/Demolition Waste	3,005	2,663	342						3,005	4
Disposable Diapers	5,303	4,699	604						5,303	7
Textiles/Leather/Rubber	8,131	7,206	926	61		55	6	61	8,070	10
Other	6,540	5,796	744	6,025		5,423	603	6,025	515	1
Subtotal (Wood - Other)	24,571	21,774	2,797	6,087		5,478	609	6,087	18,484	24
TOTAL	198,313	179,157	19,155	56,163		116,275	4,255	120,529	77,784	100

Residential Diversion = 61%
(lower estimate)

Notes

1) Composition estimates based on East York data from "Residential Waste Composition Study: Vol. I of the Ontario Waste Composition Study", Gore&Storrie, Jan/91 (excl. yard waste)

2) Wet/Dry is an add-on to the existing [illegible] system

3) Wet/Dry assumes that the materials captured in the dry stream are the Quinte materials. Capture rates are assumed to be Quinte capture rates.

4) This scenario assumes that multi-family households divert dry recyclables at [illegible] of the Quinte capture rate.

5) [illegible]

6) Wet/Dry assumes that [illegible] of food and yard waste is diverted [illegible] backyard composters)

Mixed Solid Waste System
plus Backyard Composting to Saturation
Region of York

Component	Residential Waste Generated (tonnes) All Hhlds	Res. Diversion (tonnes) Exist/Comm + B.Y. Compos.	Residential Waste Landfilled (tonnes)	Recovered for Recycling in MSW Processing	MSW plus E/C Diversion (tonnes)	Recovered for Composting in MSW Processing	MSW plus E/C plus Composting (landfilled)	MSW plus E/C plus Composting (marketed)	Residue Sent to Landfill from MSW Processing
Total Residential Waste (tonnes)	198,313	75,237	123,076						
Paper									
Newspaper	33,232	16,641	16,591	4,977	21,618	9,872	26,554	31,490	1,742
Corrugated cardboard (OCC)	5,126	677	4,449	2,224	2,902	1,891	3,847	4,793	334
Telephone Directories	367	75	291	146	221	124	283	345	22
Mixed paper	30,744	69	30,676	3,068	3,136	23,467	14,870	26,603	4,141
Subtotal (Paper)	69,469	17,462	52,007	10,415	27,877	35,353	45,554	63,231	6,239
Glass	9,899	5,770	4,129	826	6,595	0	6,595	6,595	3,304
Tinplate Steel (ferrous)	7,313	2,796	4,517	3,162	5,958	0	5,958	5,958	1,355
Aluminum (non-ferrous)	1,944	91	1,854	927	1,018	0	1,018	1,018	927
Subtotal Metal (commingled)	9,257	2,887	6,371	4,089	6,975	0	6,975	6,975	2,282
Plastic									
PET	291	282	9	9	291	0	291	291	0
HDPE	8,838	404	8,434	2,109	2,513	0	2,513	2,513	6,326
Other Plastic	2,183		2,183	0	0	0	0	0	2,183
Subtotal (Plastic)	11,312	686	10,627	2,118	2,803	0	2,803	2,803	8,509
Organics									
Food wastes	44,545	17,711	26,834	0	17,711	22,809	29,116	40,520	4,025
Yard waste	29,259	24,635	4,624	0	24,635	4,162	26,716	28,797	462
Subtotal (Organics)	73,804	42,346	31,458	0	42,346	26,971	55,831	69,317	4,488
Wood Waste	1,591		1,591	0	0	159	80	159	1,432
Construction/Demolition Waste	3,005		3,005	0	0	301	150	301	2,705
Disposable Diapers	5,303		5,303	0	0	0	0	0	5,303
Textiles/Leather/Rubber	8,131	61	8,070	807	868	0	868	868	7,263
Other	6,540	6,025	515	0	6,025	0	6,025	6,025	515
Subtotal (Wood - Other)	24,571	6,087	18,484	807	6,894	460	7,123	7,353	17,217
TOTAL	198,313	75,237	123,076	18,254	93,491	62,784	124,883	156,275	42,038
Residential Diversion =		38%			47%		63% (compost landfilled) (higher estimate)	79% (compost marketed)	

Notes:

1) This analysis assumes that there were 128,061 S-F hhlds, 15,189 Other hhlds, and 18,306 multi-family hhlds in 1992

2) Composition estimates based on East York data from "Residential Waste Composition Study, Vol I of the Ontario Waste Comp Study", Gore & Storrie Ltd., Jan/91 (excl. yard waste)

3) Yard Waste (comp. generated) data from "The Physical and Economic Dimensions of Municipal Solid Waste in Ontario", CH2MHill Eng. Ltd., Nov/91

4) White Goods (comp. generated) estimate (included in Tinplate Steel total) from "Residential Waste Comp. Study, Vol I of the Ontario Waste Comp Study", G & S Ltd., 1990

5) 80% of S-F, 40% of Other Households receive backyard composters which divert 240 kg/year (68% food, 32% yard)

Table K.10
Mixed Solid Waste System
(lower backyard composter diversion)
Region of York

Component	Residential Waste Generated (tonnes) All Hhlds	Res. Diversion (tonnes) Exist/Comm + B.Y. Compos.	Residential Waste Landfilled (tonnes)	Recovered for Recycling in MSW Processing	MSW plus E/C Diversion (tonnes)	Recovered for Composting in MSW Processing	MSW plus E/C plus Composting (landfilled)	MSW plus E/C plus Composting (marketed)	Residue Sent to Landfill from MSW Processing
Total Residential Waste (tonnes)	198,313	65,057	133,256						
Paper									
Newspaper	33,232	16,641	16,591	4,977	21,618	9,872	26,554	31,490	1,742
Corrugated cardboard (OCC)	5,126	677	4,449	2,224	2,902	1,891	3,847	4,793	334
Telephone Directories	367	75	291	146	221	124	283	345	22
Mixed paper	30,744	69	30,676	3,068	3,136	23,467	14,870	26,603	4,141
Subtotal (Paper)	69,469	17,462	52,007	10,415	27,877	35,353	45,554	63,231	6,239
Glass	9,899	5,770	4,129	826	6,595	0	6,595	6,595	3,304
Tinplate Steel (ferrous)	7,313	2,796	4,517	3,162	5,958	0	5,958	5,958	1,355
Aluminum (non-ferrous)	1,944	91	1,854	927	1,018	0	1,018	1,018	927
Subtotal Metal (commingled)	9,257	2,887	6,371	4,089	6,975	0	6,975	6,975	2,282
Plastic									
PET	291	282	9	9	291	0	291	291	0
HDPE	8,838	404	8,434	2,109	2,513	0	2,513	2,513	6,326
Other Plastic	2,183		2,183	0	0	0	0	0	2,183
Subtotal (Plastic)	11,312	686	10,627	2,118	2,803	0	2,803	2,803	8,509
Organics									
Food wastes	44,545	10,789	33,756	0	10,789	28,693	25,135	39,482	5,063
Yard waste	29,259	21,377	7,882	0	21,377	7,094	24,924	28,471	788
Subtotal (Organics)	73,804	32,166	41,638	0	32,166	35,786	50,059	67,953	5,852
Wood Waste	1,591		1,591	0	0	159	80	159	1,432
Construction/Demolition Waste	3,005		3,005	0	0	301	150	301	2,705
Disposable Diapers	5,303		5,303	0	0	0	0	0	5,303
Textiles/Leather/Rubber	8,131	61	8,070	807	868	0	868	868	7,263
Other	6,540	6,025	515	0	6,025	0	6,025	6,025	515
Subtotal (Wood - Other)	24,571	6,087	18,484	807	6,894	460	7,123	7,353	17,217
TOTAL	198,313	65,057	133,256	18,254	83,311	71,599	119,111	154,911	43,402
Residential Diversion =		33%			42%		60%	78%	
							(compost landfilled) (lower estimate)	(compost marketed)	

Notes

1) Diversion materials and estimates for Expanded Blue Box from Quinte Blue Box 2000 report for 1992
2) This analysis assumes that there were 128,[illegible] Single Family, 11,[illegible] Other Hhlds, and 18,[illegible] multi-family hhlds in 1992
3) Composition estimates based on East York data from "Residential Waste Composition Study, Vol. I of the Ontario Waste Comp. Study", Gore & Storrie Ltd., Jan/91 (excl. yard waste)
4) Yard Waste comp. generation data from "The Physical and Economic Dimensions of Municipal Solid Waste in Ontario", CH2M Hill Eng. Ltd., Nov/91
5) [illegible] comp. generation estimate [illegible] Tinplate Steel total from "Residential Waste Comp. Study, Vol. I of the Ontario Waste Comp. Study", G & S Ltd., 1991
6) [illegible] of Other Households receive backyard composters. The first 25% of [illegible] 24 kg compost, the remainder [illegible] 10 kg compost (68% food, 32% yard)

SCHEDULE L

REGION OF PEEL ESTIMATES

Existing System
Region of Peel

Component	Residential Waste Generated (tonnes) - 1992 All Households	Residential Waste Generated S-F	Residential Waste Generated M-F	Residential Diversion (tonnes) - 1992 Std. Blue Box	Residential Waste Landfilled (by difference) 1992	Composition of Disposed Waste %
Total Residential Waste (tonnes)	317,331	242,849	74,482	64,002	253,329	
Paper						
Newspaper	54,551	39,919	14,633	21,534	33,017	13
Corrugated cardboard (OCC)	8,415	6,158	2,257	1,234	7,181	3
Telephone Directories	872	667	205	712	160	
Mixed paper	50,197	36,703	13,494	469	49,728	20
Subtotal (Paper)	114,036	83,447	30,589	23,949	90,087	35
Glass	16,249	11,891	4,359	6,674	9,575	4
Tinplate Steel (ferrous)	12,167	8,903	3,264			
Aluminum (non-ferrous)	3,192	2,336	856			
Subtotal (Alum. + Tin)	15,359	11,239	4,120	6,137	9,222	4
Plastic						
PET	290	212	78			
HDPE	14,508	10,617	3,892			
Other Plastic	3,772	2,760	1,012			
Subtotal (Plastic)	18,571	13,589	4,981	694	17,877	7
Organics						
Food wastes	73,122	53,508	19,614	9,276	63,846	
Yard waste	39,661	39,661	0	12,026	27,634	
Subtotal (Organics)	112,783	93,169	19,614	21,302	91,481	36
Wood Waste	2,612	1,911	701	2,490	122	
Construction/Demolition Waste	4,933	3,610	1,323	142	4,791	
Disposable Diapers	8,705	6,370	2,335		8,705	
Textiles/Leather/Rubber	13,348	9,767	3,580	390	12,958	
Other	10,736	7,856	2,880	2,224	8,512	
Subtotal (Wood - Other)	40,333	29,514	10,819	5,246	35,087	14
TOTAL	317,331	242,849	74,482	64,002	253,329	100

Residential Diversion = 20%

Notes:

1) Composition estimates based on data for East York obtained from the "Residential Waste Composition Study, Volume I of the Ontario Waste Composition Study", Gore & Storrie Ltd, Jan/91 (excluding yard waste)
2) Yard Waste (composition generated) data obtained from "The Physical and Economic Dimensions of Municipal Solid Waste in Ontario, CH2M HILL Engineering Ltd., Nov/91
3) White Goods (composition generated) estimate (included in Tinplate Steel total) taken from "Residential Waste Composition Study, Volume I of the Ontario Waste Composition Study, Gore & Storrie Ltd., 1990
4) Diversion estimates obtained from Region of Peel.
5) There were 56,839 backyard composters distributed at the end of 1992
6) This analysis assumes that each composter diverts 240 kg/year

Table L.2
Existing System
(lower backyard composting diversion)
Region of Peel

Component	Residential Waste Generated (tonnes) - 1992 All Households	Residential Waste Generated S-F	Residential Waste Generated M-F	Residential Diversion (tonnes) - 1992 Std. Blue Box	Residential Waste Landfilled (by difference) 1992	Composition of Disposed Waste %
Total Residential Waste (tonnes)	317,331	242,849	74,482	62,198	255,133	
Paper						
Newspaper	54,551	39,919	14,633	21,534	33,017	13
Corrugated cardboard (OCC)	8,415	6,158	2,257	1,234	7,181	3
Telephone Directories	872	667	205	712	160	
Mixed paper	50,197	36,703	13,494	469	49,728	19
Subtotal (Paper)	114,036	83,447	30,589	23,949	90,087	35
Glass	16,249	11,891	4,359	6,674	9,575	4
Tinplate Steel (ferrous)	12,167	8,903	3,264			
Aluminum (non-ferrous)	3,192	2,336	856			
Subtotal (Alum + Tin)	15,359	11,239	4,120	6,137	9,222	4
Plastic						
PET	290	212	78			
HDPE	14,508	10,617	3,892			
Other Plastic	3,772	2,760	1,012			
Subtotal (Plastic)	18,571	13,589	4,981	694	17,877	7
Organics						
Food wastes	73,122	53,508	19,614	8,049	65,073	
Yard waste	39,661	39,661	0	11,449	28,212	
Subtotal (Organics)	112,783	93,169	19,614	19,498	93,285	37
Wood Waste	2,612	1,911	701	2,490	122	
Construction/Demolition Waste	4,933	3,610	1,323	142	4,791	
Disposable Diapers	8,705	6,370	2,335		8,705	
Textiles/Leather/Rubber	13,348	9,767	3,580	390	12,958	
Other	10,736	7,856	2,880	2,224	8,512	
Subtotal (Wood - Other)	40,333	29,514	10,819	5,246	35,087	14
TOTAL	317,331	242,849	74,482	62,198	255,133	100

Residential Diversion = 20%
(Lower Estimate)

Notes:

1) Composition estimates based on data for East York obtained from the "Residential Waste Composition Study Volume I of the Ontario Waste Composition Study", Gore & Storrie Ltd. Jan. 9? (excluding yard waste)
2) Yard Waste composition generated data obtained from "The Physical and Economic Dimensions of Municipal Solid Waste in Ontario", CH2M HILL Engineering Ltd., Nov. 1991
3) [illegible]
4) [illegible]
5) [illegible]
6) [illegible]

Existing/Committed System (Higher Diversion Estimate)
Region of Peel

Component	Residential Waste Generated (tonnes) - 1992 All Households	Residential Waste Generated S-F	Residential Waste Generated M-F	Residential Diversion (tonnes) - 1992 Std. Blue Box	Residential Diversion Existing/ Committed	Total Residential Diversion (tonnes)	Residential Waste Landfilled (by difference) 1992	Composition of Disposed Waste %
Total Residential Waste (tonnes)	317,331	242,849	74,482	64,002	13,880	77,882	239,449	
Paper								
Newspaper	54,551	39,919	14,633	21,534	500	22,034	32,517	14
Corrugated cardboard (OCC)	8,415	6,158	2,257	1,234	500	1,734	6,681	3
Telephone Directories	872	667	205	712		712	160	
Mixed paper	50,197	36,703	13,494	469	1,500	1,969	48,228	20
Subtotal (Paper)	114,036	83,447	30,589	23,949	2,500	26,449	87,587	37
Glass	16,249	11,891	4,359	6,674	500	7,174	9,075	4
Tinplate Steel (ferrous)	12,167	8,903	3,264					
Aluminum (non-ferrous)	3,192	2,336	856					
Subtotal Metals (commingled)	15,359	11,239	4,120	6,137	500	6,637	8,722	4
Plastic								
PET	290	212	78					
HDPE	14,508	10,617	3,892					
Other Plastic	3,772	2,760	1,012					
Subtotal (Plastic)	18,571	13,589	4,981	694	250	944	17,627	7
Organics								
Food wastes	73,122	53,508	19,614	9,276	1,958	11,235	61,888	
Yard waste	39,661	39,661	0	12,026	1,422	13,448	26,213	
Subtotal (Organics)	112,783	93,169	19,614	21,302	3,380	24,682	88,101	37
Wood Waste	2,612	1,911	701	2,490		2,490	122	
Construction/Demolition Waste	4,933	3,610	1,323	142	2,000	2,142	2,791	
Disposable Diapers	8,705	6,370	2,335				8,705	
Textiles/Leather/Rubber	13,348	9,767	3,580	390	500	890	12,458	
Other	10,736	7,856	2,880	2,224	4,250	6,474	4,262	
Subtotal (Wood - Other)	40,333	29,514	10,819	5,246	6,750	11,996	28,337	12
TOTAL	317,331	242,849	74,482	64,002	13,880	77,882	239,449	100

Residential Diversion = 25%
(Higher Estimate)

Notes:

1) Composition estimates based on East York data, from "Residential Waste Composition Study, Vol. I of the Ontario Waste Composition Study", Gore & Storne, Jan/91 (excl. yard waste)
2) Yard Waste (generated) data from "The Physical and Economic Dimensions of Municipal Solid Waste in Ontario", CH2MHILL Engineering Ltd., Nov/91
3) White Goods (generated) estimate (included in Tinplate Steel total) from Gore & Storne report listed in (1) above.
4) Diversion estimates obtained from Region of Peel 1992 Annual Report.
5) This analysis assumes that 1 urban community recycling centre, and 1 rural community recycling centre will be built within the five-year funding timeframe
6) Each urban community recycling centre will divert 8,000 tonnes of recyclables and 1,000 tonnes of HHW.
7) Each rural community recycling centre will divert 20% of urban i.e. 1,600 tonnes of recyclables, and 200 tonnes of HHW
8) 12,000 additional backyard composters will be distributed. These divert 240 kg/composter/yr.

Table 1.4
Existing/Committed System (lower backyard composter diversion)
Region of Peel

Component	Residential Waste Generated (tonnes) - 1992 All Households	Residential Waste Generated S-F	Residential Waste Generated M-F	Residential Diversion (tonnes) - 1992 Std. Blue Box	Residential Diversion Existing/ Committed	Total Residential Diversion (tonnes)	Residential Waste Landfilled (by difference) 1992	Composition of Disposed Waste %
Total Residential Waste (tonnes)	317,331	242,849	74,482	62,198	12,200	74,398	242,933	
Paper								
Newspaper	54,551	39,919	14,633	21,534	500	22,034	32,517	13
Corrugated cardboard (OCC)	8,415	6,158	2,257	1,234	500	1,734	6,681	3
Telephone Directories	872	667	205	712		712	160	
Mixed paper	50,197	36,703	13,494	469	1,500	1,969	48,228	20
Subtotal (Paper)	114,036	83,447	30,589	23,949	2,500	26,449	87,587	36
Glass	16,249	11,891	4,359	6,674	500	7,174	9,075	4
Tinplate Steel (ferrous)	12,167	8,903	3,264					
Aluminum (non-ferrous)	3,192	2,336	856					
Subtotal Metals (commingled)	15,359	11,239	4,120	6,137	500	6,637	8,722	4
Plastic								
PET	290	212	78					
HDPE	14,508	10,617	3,892					
Other Plastic	3,772	2,760	1,012					
Subtotal (Plastic)	18,571	13,589	4,981	694	250	944	17,627	7
Organics								
Food wastes	73,122	53,508	19,614	8,049	816	8,865	64,257	
Yard waste	39,661	39,661	0	11,449	884	12,333	27,328	
Subtotal (Organics)	112,783	93,169	19,614	19,498	1,700	21,198	91,585	38
Wood Waste	2,612	1,911	701	2,490		2,490	122	
Construction/Demolition Waste	4,933	3,610	1,323	142	2,000	2,142	2,791	
Disposable Diapers	8,705	6,370	2,335				8,705	
Textiles/Leather/Rubber	13,348	9,767	3,580	390	500	890	12,458	
Other	10,736	7,856	2,880	2,224	4,250	6,474	4,262	
Subtotal (Wood - Other)	40,333	29,514	10,819	5,246	6,750	11,996	28,337	12
TOTAL	**317,331**	**242,849**	**74,482**	**62,198**	**12,200**	**74,398**	**242,933**	**100**

Residential Diversion = 23%
(Lower Estimate)

Notes:

1) Composition estimates based on East York data from "Residential Waste Composition Study, Vol. 1 of the Ontario Waste Composition Study", Gore & Storrie, Jan/91 (excl. yard waste)

2) Yard Waste (generated) data from "The Physical and Economic Dimensions of Municipal Solid Waste in Ontario", CH2MHILL Engineering Ltd., Nov/91

3) Diversion estimates obtained from Region of Peel 1992 Annual Report

4) This analysis assumes that 1 urban community recycling centre, and 1 rural community recycling centre will be built within the five year funding timeframe

5) Each urban community recycling centre will divert [illegible] tonnes of recyclables and 1,000 tonnes of HHW

6) Each rural community recycling centre will divert 20% of urban i.e. 1,600 tonnes of recyclables and 200 tonnes of HHW

7) 12,000 additional backyard composters will be distributed

8) [illegible] 20% of units divert 240 kg/composter/yr; the remainder divert 100 kg/composter/year (68% food, 32% yard)

Direct Cost System
(Higher Diversion Estimate)
Region of Peel

Component	Res. Waste Generated (tonnes) All Hhlds	Residential Waste Generated S-F	Residential Waste Generated M-F	Residential Diversion (tonnes) Std. BB	Residential Diversion Existing/ Committed	Quinte Capture Rates	Residential Diversion Direct Cost	Res. Waste Landfilled (tonnes) 1992	Disposed Waste Comp. %
Total Residential Waste (tonnes)	317,331	242,849	74,482	64,002	13,880		148,616	168,715	
Paper									
Newspaper	54,551	39,919	14,633	21,534	500	82.40	44,950	9,601	6
Corrugated cardboard (OCC)	8,415	6,158	2,257	1,234	500	63.40	5,335	3,080	2
Telephone Directories	872	667	205	712		81.65	712	160	0
Mixed paper	50,197	36,703	13,494	469	1,500		1,969	48,228	29
Subtotal (Paper)	114,036	83,447	30,589	23,949	2,500		52,966	61,069	36
Glass	16,249	11,891	4,359	6,674	500	74.50	12,106	4,144	2
Tinplate Steel (ferrous)	12,167	8,903	3,264						
Aluminum (non-ferrous)	3,192	2,336	856						
Subtotal Metals (commingled)	15,359	11,239	4,120	6,137	500	78.20	12,011	3,348	2
Plastic									
PET	290	212	78			83.40	242	48	
HDPE	14,508	10,617	3,892			57.40	8,328	6,181	
Other Plastic	3,772	2,760	1,012				0	3,772	
Subtotal (Plastic)	18,571	13,589	4,981	694	250		8,570	10,001	6
Organics									
Food wastes	73,122	53,508	19,614	9,276	1,958		19,239	53,883	
Yard waste	39,661	39,661	0	12,026	1,422		31,729	7,932	
Subtotal (Organics)	112,783	93,169	19,614	21,302	3,380		50,968	61,815	37
Wood Waste	2,612	1,911	701	2,490			2,490	122	
Construction/Demolition Waste	4,933	3,610	1,323	142	2,000		2,142	2,791	
Disposable Diapers	8,705	6,370	2,335				0	8,705	
Textiles/Leather/Rubber	13,348	9,767	3,580	390	500		890	12,458	
Other	10,736	7,856	2,880	2,224	4,250		6,474	4,262	
Subtotal (Wood - Other)	40,333	29,514	10,819	5,246	6,750		11,996	28,337	17
TOTAL	**317,331**	**242,849**	**74,482**	**64,002**	**13,880**		**148,616**	**168,715**	100

Residential Diversion = 47%
(Higher Estimate)

Notes:

1) Composition estimates based on East York data, from "Residential Waste Composition Study, Vol. I of the Ontario Waste Composition Study", Gore & Storrie, Jan/91 (excl yard waste).

2) Telephone Directories are assumed to be generated at 8 lb/hh/yr

3) Diversion estimates obtained from Region of Peel 1992 Annual Report.

4) User pay assumed that residential recycling of existing Blue Box materials will reach Quinte capture rates

5) The user pay system is added to the existing/committed system

6) 80% of yard waste is diverted (by backyard composters + curbside)

7) 80% of S-F and 40% of Other Hhlds receive backyard composters, which divert 240 kg/composter/year (68% food, 32% yard)

Table L.6
Direct Cost System
(lower M-F and backyard composter diversion)
Region of Peel

Component	Res. Waste Generated (tonnes) All Hhlds	Residential Waste Generated S-F	Residential Waste Generated M-F	Residential Diversion Existing/ Committed	Quinte Capture Rates	Direct Cost Diversion S-F+Other (tonnes)	Direct Cost Diversion M-F (tonnes)	Direct Cost Diversion All Hhlds (tonnes)	Res. Waste Landfilled (tonnes) 1992	Disposed Waste Comp. %
Total Residential Waste (tonnes)	317,331	242,849	74,482	74,398		117,757	8240.49	125,998	191,333	
Paper										
Newspaper	54,551	39,919	14,633	22,034	82.40	32,893	3,617	36,510	18,041	9
Corrugated cardboard (OCC)	8,415	6,158	2,257	1,734	63.40	3,904	429	4,333	4,082	2
Telephone Directories	872	667	205	712	81.65	545	167	712	160	0
Mixed paper	50,197	36,703	13,494	1,969		1,772	197	1,969	48,228	25
Subtotal (Paper)	114,036	83,447	30,589	26,449		39,114	4,411	43,524	70,511	37
Glass	16,249	11,891	4,359	7,174	74.50	8,859	974	9,833	6,417	3
Tinplate Steel (ferrous)	12,167	8,903	3,264							
Aluminum (non ferrous)	3,192	2,336	856							
Subtotal Metals (commingled)	15,359	11,239	4,120	6,637	78.20	8,789	967	9,756	5,603	3
Plastic										
PET	290	212	78		83.40	177	19	197	94	
HDPE	14,508	10,617	3,892		57.40	6,094	670	6,764	7,744	
Other Plastic	3,772	2,760	1,012					0	3,772	
Subtotal (Plastic)	18,571	13,589	4,981	944		6,271	690	6,961	11,610	6
Organics										
Food wastes	73,122	53,508	19,614	8,865		12,200		12,200	60,922	
Yard waste	39,661	39,661	0	12,333		31,729		31,729	7,932	
Subtotal (Organics)	112,783	93,169	19,614	21,198		43,929	0	43,929	68,854	36
Wood Waste	2,612	1,911	701	2,490		2,241	249	2,490	122	
Construction/Demolition Waste	4,933	3,610	1,323	2,142		1,928	214	2,142	2,791	
Disposable Diapers	8,705	6,370	2,335					0	8,705	
Textiles/Leather/Rubber	13,348	9,767	3,580	890		801	89	890	12,458	
Other	10,736	7,856	2,880	6,474		5,827	647	6,474	4,262	
Subtotal (Wood - Other)	40,333	29,514	10,819	11,996		10,796	1,200	11,996	28,337	15
TOTAL	317,331	242,849	74,482	74,398		117,757	8,240	125,998	191,333	100

Residential Diversion = 40%

(Lower Estimate)

Notes:

1. Composition estimates based on East York data from "Residential Waste Composition Study, Vol. I of the Ontario Waste Composition Study" Gore & Storrie, Jan. 91 (exc. yard waste)

2. Yard Waste generated data from "The Physical and Economic Dimensions of Municipal Solid Waste in Ontario", CH2MHILL Engineering Ltd., Nov. 91

4. [illegible]

5. [illegible]

6. [illegible]

[illegible]

Expanded Blue Box
(Higher Diversion Estimate)
Region of Peel

Component	Residential Waste Gen. (tonnes) All Hhlds	Residential Waste Generated S-F+Other	Residential Waste Generated M-F	Res. Div. Existing + Existing/ Committed	Capture Rate (%) Exp. BB	Res. Div. (tonnes) Exp. BB S-F+Other	Res. Div. (tonnes) Exp. BB M-F Hhlds	Residential Diversion All Hhlds	Res. Waste Landfilled (tonnes) 1992	Disposed Waste Comp. %
Total Residential Waste (tonnes)	317,331	242,849	74,482	77,882		122,867	28,900	151,767	165,564	
Paper										
Newspaper	54,551	39,919	14,633	22,034	82.40	32,893	12,057	44,950	9,601	6
Corrugated cardboard (OCC)	8,415	6,158	2,257	1,734	63.40	3,904	1,431	5,335	3,080	2
Telephone Directories	872	667	205	712	81.65	545	167	712	160	
Mixed paper	50,197	36,704	13,494	1,969	37.46	13,749	5,055	18,804	31,393	19
Subtotal (Paper)	114,036	83,447	30,589	26,449		51,091	18,710	69,801	44,234	27
Glass	16,249	11,891	4,359	7,174	74.50	8,859	3,247	12,106	4,144	3
Tinplate Steel (ferrous)	12,167	8,903	3,264							
Aluminum (non-ferrous)	3,192	2,336	856							
Subtotal Metal(commingled)	15,359	11,239	4,120	6,637	78.20	8,789	3,222	12,011	3,348	2
Plastic										
PET	290	212	78		83.40	177	65	242	48	
HDPE	14,508	10,617	3,892		57.40	6,094	2,234	8,328	6,181	
Other Plastic	3,772	2,760	1,012		22.00	607	223	830	2,942	
Subtotal (Plastic)	18,571	13,589	4,981	944		6,878	2,521	9,400	9,171	6
Organics										
Food wastes	73,122	53,508	19,614	11,235		19,239		19,239	53,883	
Yard waste	39,661	39,661	0	13,448		17,215		17,215	22,446	
Subtotal (Organics)	112,783	93,169	19,614	24,682		36,454		36,454	76,329	46
Wood Waste	2,612	1,911	701	2,490		2,241	249	2,490	122	
Construction/Demolition Waste	4,933	3,610	1,323	2,142		1,928	214	2,142	2,791	
Disposable Diapers	8,705	6,370	2,335						8,705	
Textiles/Leather/Rubber	13,348	9,767	3,580	890		801	89	890	12,458	
Other	10,736	7,856	2,880	6,474		5,827	647	6,474	4,262	
Subtotal (Wood - Other)	40,333	29,514	10,819	11,996		10,796	1,200	11,996	28,337	17
TOTAL	317,331	242,849	74,482	77,882		122,867	28,900	151,767	165,564	100

Residential Diversion = 48%
(Higher Estimate)

Notes:

1) Composition estimates based on East York data from "Residential Waste Composition Study, Vol. I of the Ontario Waste Comp. Study", Gore & Storne Ltd., Jan/91 (excl yard waste).

2) Expanded Blue Box is an add-on to the existing/committed system.

3) Diversion materials and estimates for Expanded Blue Box from Quinte Blue Box 2000 report for 1992

4) This analysis assumes that there were 118,927 S-F hhlds, 56,862 Other hhlds, and 64,439 multi-family hhlds in 1992

4) Existing capture rate for phone books is already greater than that for Quinte, therefore use existing rate of 81.65%.

5) 80% of S-F and 40% of other households receive backyard composters, which divert 240 kg/year (68% food, 32% yard).

Table L.8
Expanded Blue Box System
(lower M-F and backyard composter diversion)
Region of Peel

Component	Residential Waste Gen. (tonnes) All Hhlds	Residential Waste Generated S-F+Other	Residential Waste Generated M-F	Res. Div. Existing + Existing/ Committed	Capture Rate (%) Exp. BB	Res. Div. (tonnes) Exp. BB S-F+Other	Res. Div. (tonnes) Exp. BB M-F Hhlds	Residential Diversion All Hhlds	Res. Waste Landfilled (tonnes) 1992	Disposed Waste Comp. %
Total Residential Waste (tonnes)	317,331	242,849	74,482	77,882		112,515	9,627	122,142	195,189	
Paper										
Newspaper	54,551	39,919	14,633	22,034	82.40	32,893	3,617	36,510	18,041	9
Corrugated cardboard (OCC)	8,415	6,158	2,257	1,734	63.40	3,904	429	4,333	4,082	2
Telephone Directories	872	667	205	712	81.65	545	167	712	160	
Mixed paper	50,197	36,704	13,494	1,969	37.46	13,749	1,516	15,266	34,932	18
Subtotal (Paper)	114,036	83,447	30,589	26,449		51,091	5,730	56,821	57,215	29
Glass	16,249	11,891	4,359	7,174	74.50	8,859	974	9,833	6,417	3
Tinplate Steel (ferrous)	12,167	8,903	3,264							
Aluminum (non-ferrous)	3,192	2,336	856							
Subtotal Metal(commingled)	15,359	11,239	4,120	6,637	78.20	8,789	967	9,756	5,603	3
Plastic										
PET	290	212	78		83.40	177	19	197	94	
HDPE	14,508	10,617	3,892		57.40	6,094	670	6,764	7,744	
Other Plastic	3,772	2,760	1,012		22.00	607	67	674	3,098	
Subtotal (Plastic)	18,571	13,589	4,981	944		6,878	756	7,635	10,936	6
Organics										
Food wastes	73,122	53,508	19,614	8,865		12,200		12,200	60,922	
Yard waste	39,661	39,661	0	12,333		13,902		13,902	25,759	
Subtotal (Organics)	112,783	93,169	19,614	21,198		26,102		26,102	86,681	44
Wood Waste	2,612	1,911	701	2,490		2,241	249	2,490	122	
Construction/Demolition Waste	4,933	3,610	1,323	2,142		1,928	214	2,142	2,791	
Disposable Diapers	8,705	6,370	2,335						8,705	
Textiles/Leather/Rubber	13,348	9,767	3,580	890		801	89	890	12,458	
Other	10,736	7,856	2,880	6,474		5,827	647	6,474	4,262	
Subtotal (Wood - Other)	40,333	29,514	10,819	11,996		10,796	1,200	11,996	28,337	15
TOTAL	317,331	242,849	74,482	74,398		112,515	9,627	122,142	195,189	100

Diversion = 38%

Notes:

1) Expanded Blue Box is an add-on to the existing/committed system
2) Diversion materials and estimates for Expanded Blue Box from Quinte Blue Box 2000 report for 1992
3) This analysis assumes that there were [illegible] S-F hhlds, [illegible] Other hhlds and 64,439 multi-family hhlds in 1992
4) This scenario assumes that multi-family households divert [illegible] at 40% of the Quinte capture rate
5) Existing capture rate for phone books is already greater than that for Quinte, therefore use existing rate of 81.65%
6) [illegible]

Table L.9

Wet/Dry to All Households,

with Backyard Composters Distributed to 80% of S-F Hhlds and 40% of Other Hhlds

80% of Organics Diverted

Region of Peel

Component	Residential Waste Gen. (tonnes) All Hhlds	Residential Waste Generated S-F+Other	Residential Waste Generated M-F	Res. Div. Existing + Existing/ Committed	Capture Rate (%) Exp. BB	Res. Div. (tonnes) Exp. BB S-F+Other	Res. Div. (tonnes) Exp. BB M-F Hhlds	Residential Diversion All Hhlds	Res. Waste Landfilled (tonnes) 1992	Disposed Waste Comp. %
Total Residential Waste (tonnes)	317,331	242,849	74,482	77,882		160,948	44,592	205,540	111,791	
Paper										
Newspaper	54,551	39,919	14,633	22,034	82.40	32,893	12,057	44,950	9,601	9
Corrugated cardboard (OCC)	8,415	6,158	2,257	1,734	63.40	3,904	1,431	5,335	3,080	3
Telephone Directories	872	667	205	712	81.65	545	167	712	160	
Mixed paper	50,197	36,703	13,494	1,969	37.46	13,749	5,055	18,804	31,393	28
Subtotal (Paper)	114,036	83,447	30,589	26,449		51,091	18,711	69,801	44,234	39
Glass	16,249	11,891	4,359	7,174	74.50	8,859	3,247	12,106	4,144	4
Tinplate Steel (ferrous)	12,167	8,903	3,264							
Aluminum (non-ferrous)	3,192	2,336	856							
Subtotal Metal(commingled)	15,359	11,239	4,120	6,637	78.20	8,789	3,222	12,011	3,348	3
Plastic										
PET	290	212	78		83.40	177	65	242	48	
HDPE	14,508	10,617	3,892		57.40	6,094	2,234	8,328	6,181	
Other Plastic	3,772	2,760	1,012		22.00	607	223	830	2,942	
Subtotal (Plastic)	18,571	13,589	4,981	944		6,878	2,521	9,400	9,171	8
Organics										
Food wastes	73,122	53,508	19,614	11,235		42,806	15,691	58,498	14,624	
Yard waste	39,661	39,661	0	13,448		31,729		31,729	7,932	
Subtotal (Organics)	112,783	93,169	19,614	24,682		74,535	15,691	90,226	22,557	20
Wood Waste	2,612	1,911	701	2,490		2,241	249	2,490	122	
Construction/Demolition Waste	4,933	3,610	1,323	2,142		1,928	214	2,142	2,791	
Disposable Diapers	8,705	6,370	2,335						8,705	
Textiles/Leather/Rubber	13,348	9,767	3,580	890		801	89	890	12,458	
Other	10,736	7,856	2,880	6,474		5,827	647	6,474	4,262	
Subtotal (Wood - Other)	40,333	29,514	10,819	11,996		10,796	1,200	11,996	28,337	25
TOTAL	317,331	242,849	74,482	77,882		160,948	44,592	205,540	111,791	100

Diversion = 65%

Notes:

1) Wet/dry assumes dry diversion estimates equivalent to Expanded Blue Box from Quinte Blue Box 2000 report for 1992

2) Wet/dry assumes that 80% of organics (food+yard) are diverted.

3) Wet/dry is added on to the existing/committed system

4) This analysis assumes that there were 118,927 S-F hhlds, 56,862 Other hhlds, and 64,439 multi-family hhlds in 1992

5) Composition estimates based on East York data from "Residential Waste Composition Study, Vol. 1 of the Ontario Waste Comp. Study", Gore & Storrie Ltd., Jan/91 excl. yard waste

6) Yard Waste (comp. generated) data from "The Physical and Economic Dimensions of Municipal Solid Waste in Ontario", CH2MHill Eng. Ltd., Nov/91

7) White Goods (comp. generated) estimate (included in Tinplate Steel total) from "Residential Waste Comp. Study, Vol. 1 of the Ontario Waste Comp. Study", G & S Ltd. 1991

Table L.10
Wet/Dry System
(lower M-F and backyard composter diversion)
Region of Peel

Component	Residential Waste Gen. (tonnes) All Hhlds	Residential Waste Generated S-F+Other	Residential Waste Generated M-F	Res. Div. Existing + Existing/ Committed	Capture Rate (%) Exp. BB	Res. Div. (tonnes) Exp. BB S-F+Other	Res. Div. (tonnes) Exp. BB M-F Hhlds	Residential Diversion All Hhlds	Res. Waste Landfilled (tonnes) 1992	Disposed Waste Comp. %
Total Residential Waste (tonnes)	317,331	242,849	74,482	77,882		160,948	15,511	176,459	140,872	
Paper										
Newspaper	54,551	39,919	14,633	22,034	82.40	32,893	3,617	36,510	18,041	13
Corrugated cardboard (OCC)	8,415	6,158	2,257	1,734	63.40	3,904	429	4,333	4,082	3
Telephone Directories	872	667	205	712	81.65	545	167	712	160	
Mixed paper	50,197	36,703	13,494	1,969	37.46	13,749	1,516	15,266	34,932	25
Subtotal (Paper)	114,036	83,447	30,589	26,449		51,091	5,730	56,821	57,215	41
Glass	16,249	11,891	4,359	7,174	74.50	8,859	974	9,833	6,417	5
Tinplate Steel (ferrous)	12,167	8,903	3,264							
Aluminum (non-ferrous)	3,192	2,336	856							
Subtotal Metal(commingled)	15,359	11,239	4,120	6,637	78.20	8,789	967	9,756	5,603	4
Plastic										
PET	290	212	78		83.40	177	19	197	94	
HDPE	14,508	10,617	3,892		57.40	6,094	670	6,764	7,744	
Other Plastic	3,772	2,760	1,012		22.00	607	67	674	3,098	
Subtotal (Plastic)	18,571	13,589	4,981	944		6,878	756	7,635	10,936	8
Organics										
Food wastes	73,122	53,508	19,614	11,235		42,806	5,884	48,691	24,432	
Yard waste	39,661	39,661	0	13,448		31,729		31,729	7,932	
Subtotal (Organics)	112,783	93,169	19,614	24,682		74,535	5,884	80,419	32,364	23
Wood Waste	2,612	1,911	701	2,490		2,241	249	2,490	122	
Construction/Demolition Waste	4,933	3,610	1,323	2,142		1,928	214	2,142	2,791	
Disposable Diapers	8,705	6,370	2,335						8,705	
Textiles/Leather/Rubber	13,348	9,767	3,580	890		801	89	890	12,458	
Other	10,736	7,856	2,880	6,474		5,827	647	6,474	4,262	
Subtotal (Wood - Other)	40,333	29,514	10,819	11,996		10,796	1,200	11,996	28,337	20
TOTAL	317,331	242,849	74,482	77,882		160,948	15,511	176,459	140,872	100

Diversion : 56%

Notes

1) Wet/dry assumes dry diversion rates equivalent to Expanded Blue Box from Quinte Blue Box 2000 report for 1992
2) Wet/dry assumes that 80% of organics (food+yard) are diverted
3) Wet/Dry is added on to the existing/committed system
4) The analysis assumes that there were [illegible] S-F homes, [illegible] and [illegible] multi-family households in 1992.
5) This scenario assumes that multi-family households divert the recyclables at 30% of the Quinte capture rates.
6) This scenario assumes that multi-family households divert 30% of their food waste.

Table L.11
Mixed Waste Processing System
plus Backyard Composting to Saturation
Region of Peel

Component	Residential Waste Generated (tonnes) All Hhlds	Res. Diversion Existing+E/C plus Backyard Composters	Residential Waste Landfilled (tonnes)	Recovered for Recycling in MSW Processing	MSW plus E/C Diversion (tonnes)	Recovered for Composting in MSW Processing	MSW plus E/C plus Composting (landfilled)	MSW plus E/C plus Composting (marketed)	Residue Sent to Landfill from MSW Processing
Total Residential Waste (tonnes)	317,331	89,654	227,677						
Paper									
Newspaper	54,551	22,034	32,517	9,755	31,789	19,348	41,463	51,137	3,414
Corrugated cardboard (OCC)	8,415	1,734	6,681	3,341	5,075	2,840	6,494	7,914	501
Telephone Directories	872	712	160	80	792	68	826	860	12
Mixed paper	50,197	1,969	48,228	4,823	6,792	36,894	25,239	43,686	6,511
Subtotal (Paper)	114,036	26,449	87,587	17,999	44,448	59,150	74,023	103,598	10,438
Glass	16,249	7,174	9,075	1,815	8,989	0	8,989	8,989	7,260
Tinplate Steel (ferrous)	12,167			0		0	0	0	0
Aluminum (non-ferrous)	3,192			0		0	0	0	0
Subtotal Metal (commingled)	15,359	6,637	8,722	5,743	12,380	0	12,380	12,380	2,979
Plastic									
PET	290	247	44	44	290	0	290	290	0
HDPE	14,508	698	13,811	3,453	4,150	0	4,150	4,150	10,358
Other Plastic	3,772		3,772	0	0	0	0	0	3,772
Subtotal (Plastic)	18,570	944	17,626	3,496	4,440	0	4,440	4,440	14,130
Organics									
Food wastes	73,122	19,239	53,883	0	19,239	45,800	42,139	65,040	8,082
Yard waste	39,661	17,215	22,446	0	17,215	20,202	27,316	37,416	2,245
Subtotal (Organics)	112,783	36,454	76,329	0	36,454	66,002	69,455	102,456	10,327
Wood Waste	2,612	2,490	122	0	2,490	12	2,496	2,502	110
Construction/Demolition Waste	4,933	2,142	2,791	0	2,142	279	2,282	2,421	2,512
Disposable Diapers	8,705		8,705	0	0	0	0	0	8,705
Textiles/Leather/Rubber	13,348	890	12,458	1,246	2,136	0	2,136	2,136	11,212
Other	10,736	6,474	4,262	0	6,474	0	6,474	6,474	4,262
Subtotal (Wood - Other)	40,334	11,996	28,338	1,246	13,242	291	13,387	13,533	26,801
TOTAL	317,331	89,654	227,677	30,299	119,952	125,443	182,674	245,396	71,935
Residential Diversion =		28%			38%		58% (compost landfilled) (higher estimate)	77% (compost marketed)	

Notes:

1) The MSW System assumes the same diversion as for existing/committed system, plus backyard composting to saturation.

2) This analysis assumes that there were 118,927 S F hhlds, 56,862 Other hhlds, and 64,439 multi family hhlds in 1992

3) 80% of single-family and 40% of other households receive backyard composters. These divert 240 kg/composter/yr (68% food, 32% yard)

Table L.12
Mixed Waste Processing System
(lower backyard composter diversion)
Region of Peel

Component	Residential Waste Generated (tonnes) All Hhlds	Res. Diversion Existing+E/C plus Backyard Composters	Residential Waste Landfilled (tonnes)	Recovered for Recycling in MSW Processing	MSW plus E/C Diversion (tonnes)	Recovered for Composting in MSW Processing	MSW plus E/C plus Composting (landfilled)	MSW plus E/C plus Composting (marketed)	Residue Sent to Landfill from MSW Processing
Total Residential Waste (tonnes)	317,331	79,302	238,029						
Paper									
Newspaper	54,551	22,034	32,517	9,755	31,789	19,348	41,463	51,137	3,414
Corrugated cardboard (OCC)	8,415	1,734	6,681	3,341	5,075	2,840	6,494	7,914	501
Telephone Directories	872	712	160	80	792	68	826	860	12
Mixed paper	50,197	1,969	48,228	4,823	6,792	36,894	25,239	43,686	6,511
Subtotal (Paper)	114,036	26,449	87,587	17,999	44,448	59,150	74,023	103,598	10,438
Glass	16,249	7,174	9,075	1,815	8,989	0	8,989	8,989	7,260
Tinplate Steel (ferrous)	12,167			0		0	0	0	0
Aluminum (non-ferrous)	3,192			0		0	0	0	0
Subtotal Metal (commingled)	15,359	6,637	8,722	5,743	12,380	0	12,380	12,380	2,979
Plastic									
PET	290	247	44	44	290	0	290	290	0
HDPE	14,508	698	13,811	3,453	4,150	0	4,150	4,150	10,358
Other Plastic	3,772		3,772	0	0	0	0	0	3,772
Subtotal (Plastic)	18,570	944	17,626	3,496	4,440	0	4,440	4,440	14,130
Organics									
Food wastes	73,122	12,200	60,922	0	12,200	51,784	38,092	63,984	9,138
Yard waste	39,661	13,902	25,759	0	13,902	23,183	25,494	37,085	2,576
Subtotal (Organics)	112,783	26,102	86,681	0	26,102	74,967	63,586	101,069	11,714
Wood Waste	2,612	2,490	122	0	2,490	12	2,496	2,502	110
Construction/Demolition Waste	4,933	2,142	2,791	0	2,142	279	2,282	2,421	2,512
Disposable Diapers	8,705		8,705	0	0	0	0	0	8,705
Textiles/Leather/Rubber	13,348	890	12,458	1,246	2,136	0	2,136	2,136	11,212
Other	10,736	6,474	4,262	0	6,474	0	6,474	6,474	4,262
Subtotal (Wood - Other)	40,334	11,996	28,338	1,246	13,242	291	13,387	13,533	26,801
TOTAL	317,331	79,302	238,029	30,299	109,601	134,408	176,805	244,009	73,322
Residential Diversion =		25%			35%		56% (compost landfilled) (lower estimate)	77% (compost marketed)	

Notes:

1. The MSW System assumes the same diversion as for existing/committed system, plus backyard composting to saturation.
2. This analysis assumes that there were 118,927 S.F. hhlds, 56,862 Other hhlds, and 64,439 multi-family hhlds in 1992.
3. 80% of single-family and 40% of other households receive backyard composters. The first 25% of hhlds divert 240 kg/composter/yr, the remainder divert 100 kg/comp/yr (68% food, 32% yard).

SCHEDULE M

REGION OF HALTON ESTIMATES

Table M.1
Existing System
Region of Halton

Component	Residential Waste Generated (tonnes) 1992	Residential Waste Generated (tonnes) S-F + Other	Residential Waste Generated (tonnes) M-F	Residential Diversion (tonnes) 1992	Residential Waste Landfilled (by difference) 1992	Composition of Disposed Waste %
Total Residential Waste (tonnes)	137,018	113,577	23,441	48,218	88,800	
Paper						
Newspaper	23,298	18,669	4,629	15,923	7,375	8
Corrugated cardboard (OCC)	3,594	2,880	714	2,177	1,417	2
Mixed paper	21,811	17,478	4,334		21,811	25
Subtotal (Paper)	48,704	39,027	9,677	18,100	30,604	34
Glass	6,940	5,561	1,379	4,944	1,996	2
Tinplate Steel (ferrous)	5,075	4,164	911			0
Aluminum (non-ferrous)	1,363	1,092	271			0
Plastic						
PET	124	99	25			
HDPE	6,196	4,965	1,231			
Other Plastic	1,611	1,291	320			
Subtotal (Tin, Alum,Plastic)	14,370	11,612	2,758	3,650	10,720	12
Organics						
Food wastes	31,230	25,025	6,205	4,194	27,036	
Yard waste	18,549	18,549	0	16,974	1,575	
Subtotal (Organics)	49,779	43,574	6,205	21,168	28,611	32
Wood Waste	1,115	894	222		1,115	
Construction/Demolition Waste	2,107	1,688	419	356	1,751	
Disposable Diapers	3,718	2,979	739		3,718	
Textiles/Leather/Rubber	5,701	4,568	1,133		5,701	
Other	4,585	3,674	911		4,585	
Subtotal (Wood - Other)	17,226	13,803	3,423	356	16,870	19
TOTAL	137,018	113,577	23,441	48,218	88,800	100

Residential Diversion = 35%

Notes:

1) Composition estimates based on data for East York obtained from the "Residential Waste Composition Study, Volume I of the Ontario Waste Composition Study", Gore & Storrie Ltd, Jan/91 (excluding yard waste)
2) Yard Waste (composition generated) data obtained from "The Physical and Economic Dimensions of Municipal Solid Waste in Ontario, CH2M HILL Engineering Ltd., Nov/91
3) White Goods (composition generated) estimate (included in Tinplate Steel total) taken from "Residential Waste Composition Study, Volume I of the Ontario Waste Composition Study, Gore & Storrie Ltd , 1990)
4) Diversion estimates provided by Region of Halton
5) There were 77,008 single family, 16,080 multi family and 21,592 other households in Region of Halton in 1992 (data supplied by Hardy Stevenson & Asso.

Table M.2
Existing/Committed System
Region of Halton

Component	Residential Waste Generated (tonnes) 1992	Residential Waste Generated (tonnes) S-F + Other	Residential Waste Generated (tonnes) M-F	Residential Diversion (tonnes) 1992	Additional Diversion Existing/ Committed	Total Residential Diversion	Residential Waste Landfilled (by difference) 1992	Composition of Disposed Waste %
Total Residential Waste (tonnes)	137,018	113,577	23,441	48,218	6,250	54,468	82,550	
Paper								
Newspaper	23,298	18,669	4,629	15,923				0
Corrugated cardboard (OCC)	3,594	2,880	714	2,177				0
Mixed paper	21,811	17,478	4,334		4,515			0
Subtotal (Paper)	48,704	39,027	9,677	18,100	4,515	22,615	26,089	0
Glass	6,940	5,561	1,379	4,944	15	4,959	1,981	2
Tinplate Steel (ferrous)	5,075	4,164	911		15			0
Aluminum (non-ferrous)	1,363	1,092	271		305			0
Plastic								
PET	124	99	25					
HDPE	6,196	4,965	1,231		100			
Other Plastic	1,611	1,291	320		100			
Subtotal (Tin, Alum, Plastic)	14,370	11,612	2,758	3,650	520	4,170	10,200	12
Organics								
Food wastes	31,230	25,025	6,205	4,194	816			
Yard waste	18,549	18,549	0	16,974	384			
Subtotal (Organics)	49,779	43,574	6,205	21,168	1,200	22,368	27,411	33
Wood Waste	1,115	894	222			0	1,115	
Construction/Demolition Waste	2,107	1,688	419	356		356	1,751	
Disposable Diapers	3,718	2,979	739			0	3,718	
Textiles/Leather/Rubber	5,701	4,568	1,133			0	5,701	
Other	4,585	3,674	911			0	4,585	
Subtotal (Wood - Other)	17,226	13,803	3,423	356			16,870	20
TOTAL	137,018	113,577	23,441	48,218	6,250	54,468	82,550	68

Diversion = 40%

Notes:

1) Composition estimates based on East York data from the "Residential Waste Composition Study, Vol. I of the Ontario Waste Composition Study", Gore&Storrie Ltd., Jan./91 (excl. yard waste)

2) Yard Waste (comp generated) data from "The Physical and Economic Dimensions of Municipal Solid Waste in Ontario", CH2MHill Eng. Ltd., Nov/91

3) White Goods (composition generated estimate included in Tinplate Steel total) from Gore & Storrie, 1990

4) Diversion estimates provided by Region of Halton

5) There were [illegible] households in Region of Halton in 1992 (data supplied by Hardy Stevenson & Assoc.)

6) Existing/Committed system [illegible] Blue Box materials (PET, HDPE, Boxboard, Fine Paper)

[illegible]

[illegible]

SCHEDULE N

IC&I WASTE COMPOSITION ESTIMATE TABLES

Table N-1

Estimated Unit Generation Rates and Waste Composition for Major SIC Groups for Region of Durham 1992

Major IC&I Group		Unit Generation Rate (t/emp/year)	Waste Composition 1 OCC	2 ONP	3 Paper	4 Glass	5 Ferrous	6 Non-ferr	7 HDPE	8 PET	9 Plastic	10 Food	11 Yard	12 Wood	13 Other	Total
1 Primary	(%)	0.32	25.1%	0.0%	9.9%	0.0%	12.5%	5.5%	0.0%	0.0%	1.7%	0.0%	0.0%	30.4%	15.0%	100.0%
	(tonnes)		145	0	57	0	72	31	0	0	10	0	0	175	86	576
2 Manufacturing	(%)	1.41	11.6%	3.2%	19.2%	2.1%	13.1%	6.3%	0.1%	0.0%	8.8%	2.0%	0.8%	18.3%	14.5%	100.0%
	(tonnes)		8,323	2,332	13,776	1,491	9,395	4,493	72	10	6,322	1,452	610	13,163	10,402	71,842
4 Transportation/	(%)	0.73	13.9%	5.4%	26.6%	3.1%	14.8%	11.1%	0.9%	0.4%	11.7%	1.8%	0.3%	3.8%	6.3%	100.0%
Communication/ Utilities	(tonnes)		1,243	483	2,381	282	1,326	991	78	34	1,051	163	27	337	567	8,965
5 Trade: Wholesale	(%)	1.10	27.0%	1.0%	11.5%	0.8%	4.0%	2.5%	0.0%	0.0%	16.7%	5.0%	0.8%	22.0%	8.7%	100.0%
	(tonnes)		4,301	159	1,832	127	637	393	0	0	2,661	797	127	3,505	1,392	15,931
6 Trade: Retail	(%)	0.98	24.7%	11.3%	27.9%	3.7%	2.9%	0.4%	5.9%	0.1%	4.8%	11.8%	0.7%	1.4%	4.4%	100.0%
	(tonnes)		5,428	2,486	6,138	824	642	80	1,307	18	1,060	2,587	161	308	967	22,006
7 Financial, Insurance	(%)	0.17	10.1%	2.1%	48.7%	2.9%	3.1%	2.1%	0.9%	0.5%	7.2%	7.6%	1.0%	2.7%	11.1%	100.0%
& Real Estate	(tonnes)		79	16	380	22	25	17	7	4	56	59	8	21	87	780
8 Services:	(%)	0.84	6.2%	4.3%	30.0%	1.2%	11.7%	11.6%	0.1%	0.0%	10.6%	10.0%	7.1%	0.4%	6.7%	100.0%
Non-Commercial	(tonnes)		752	519	3,623	148	1,413	1,405	9	5	1,282	1,208	862	45	807	12,075
9 Services:	(%)	0.81	14.1%	2.6%	23.6%	11.2%	5.4%	2.5%	2.6%	0.7%	5.1%	27.8%	0.8%	1.3%	2.5%	100.0%
Commercial	(tonnes)		3,085	565	5,169	2,447	1,188	542	571	151	1,123	6,091	167	283	557	21,939
10 Public	(%)	20.5%	10.0%	0.0%	38.0%	5.0%	3.0%	1.7%	0.0%	0.0%	7.0%	2.0%	0.0%	0.0%	33.3%	100.0%
Administration	(tonnes)		346	0	1,315	173	104	58	0	0	242	69	0	0	1,153	3,461
Total waste	(tonnes)		23,703	6,561	34,672	5,515	14,800	8,009	2,044	221	13,807	12,426	1,962	17,838	16,018	157,574
Composition	(% total)		15%	4%	22%	3%	9%	5%	1%	0%	9%	8%	1%	11%	10%	100%

Table N-2
Estimated Unit Generation Rates and Waste Composition
for Major SIC Groups for Metropolitan Toronto
1992

Major IC&I Group		Unit Generation Rate (t/emp/year)	Waste Composition 1 OCC	2 ONP	3 Paper	4 Glass	5 Ferrous	6 Non-Ferr.	7 HDPE	8 PET	9 Plastic	10 Food	11 Yard	12 Wood	13 Other	Total
1 Primary	(%)	1.25	14.4%	0.0%	7.3%	0.0%	20.5%	13.9%	0.0%	0.0%	2.0%	0.0%	0.0%	17.9%	24.1%	100.0%
	(tonnes)		1,363	0	685	0	1,931	1,307	0	0	190	0	0	1,689	2,273	
2 Manufacturing	(%)	1.85	14.3%	2.9%	22.2%	1.9%	9.9%	5.2%	0.3%	0.1%	9.1%	5.1%	0.6%	14.9%	13.5%	100.0%
	(tonnes)		61,377	12,290	95,393	8,007	42,674	22,348	1,323	251	39,074	21,889	2,645	64,179	57,970	
4 Transportation/	(%)	1.04	14.0%	6.0%	25.0%	3.5%	15.4%	11.7%	1.1%	0.4%	11.8%	2.4%	0.3%	3.4%	5.0%	100.0%
Communication/ Utilities	(tonnes)		10,523	4,512	18,773	2,618	11,590	8,754	829	306	8,886	1,824	245	2,521	3,733	
5 Trade Wholesale	(%)	1.52	27.0%	1.0%	11.5%	0.8%	3.5%	2.0%	0.0%	0.0%	16.7%	5.0%	0.8%	22.0%	9.6%	100.0%
	(tonnes)		42,051	1,557	17,911	1,246	5,498	3,186	0	0	26,009	7,787	1,246	34,264	14,989	
6 Trade Retail	(%)	1.40	24.7%	11.4%	28.6%	3.7%	2.5%	0.4%	5.7%	0.1%	5.0%	12.1%	0.7%	1.4%	3.7%	100.0%
	(tonnes)		34,455	15,922	39,876	5,188	3,555	490	7,983	139	6,964	16,907	1,034	1,949	5,147	
7 Financial, Insurance	(%)	0.23	8.5%	2.0%	54.7%	4.0%	1.8%	1.3%	1.7%	0.9%	8.7%	7.9%	0.3%	0.7%	7.5%	100.0%
& Real Estate	(tonnes)		7,751	1,850	49,712	3,645	1,614	1,158	1,578	779	7,926	7,197	236	650	6,846	
8 Services	(%)	0.93	6.7%	4.9%	30.0%	1.9%	11.1%	11.5%	0.2%	0.1%	10.0%	10.0%	6.6%	1.1%	5.8%	100.0%
Non-Commercial	(tonnes)		10,308	7,576	46,257	2,902	17,094	17,723	352	176	15,469	15,419	10,178	1,761	8,976	
9 Services	(%)	0.96	11.8%	3.3%	29.0%	9.1%	7.0%	4.0%	2.8%	0.7%	6.0%	20.8%	0.7%	1.3%	3.2%	100.0%
Commercial	(tonnes)		28,719	8,125	70,515	22,209	17,108	9,769	6,790	1,769	14,636	50,649	1,694	3,157	7,841	
10 Public	(%)	0.32	10.0%	0.0%	38.0%	5.0%	3.0%	1.6%	0.0%	0.0%	7.0%	2.0%	0.0%	0.0%	33.4%	100.0%
Administration	(tonnes)		2,348	0	8,922	1,174	704	367	0	0	1,643	470	0	0	7,850	
Total Waste	(tonnes)		198,895	51,833	348,043	46,989	101,768	65,102	18,855	3,421	120,798	122,142	17,277	110,168	115,625	1,320,918
Composition	(% total)		15.1%	3.9%	26.3%	3.6%	7.7%	4.9%	1.4%	0.3%	9.1%	9.2%	1.3%	8.3%	8.8%	100.0%

Table N-3

Estimated Unit Generation Rates and Waste Composition for Major SIC Groups for York Region 1992

Major IC&I Group		Unit Generation Rate (t/emp/year)	Waste Composition 1 OCC	2 ONP	3 Paper	4 Glass	5 Ferrous	6 Non-Ferr.	7 HDPE	8 PET	9 Plastic	10 Food	11 Yard	12 Wood	13 Other	Total
1 Primary	(%)	0.54	22.8%	0.0%	9.8%	0.0%	13.4%	6.6%	0.0%	0.0%	2.2%	0.0%	0.0%	28.5%	16.7%	100.0%
	(tonnes)		266	0	114	0	156	77	0	0	26	0	0	332	194	
2 Manufacturing	(%)	1.80	12.6%	2.8%	20.8%	1.8%	12.8%	6.7%	0.2%	0.0%	8.3%	2.8%	0.6%	18.8%	11.8%	100.0%
	(tonnes)		15,727	3,548	25,881	2,245	15,920	8,326	228	31	10,375	3,467	734	23,478	14,752	
4 Transportation/	(%)	1.30	14.6%	6.5%	22.2%	3.8%	17.1%	13.2%	1.0%	0.5%	12.3%	2.0%	0.4%	3.2%	3.3%	100.0%
Communication/ Utilities	(tonnes)		2,274	1,015	3,441	594	2,656	2,047	150	72	1,909	303	58	498	508	
5 Trade: Wholesale	(%)	1.60	27.0%	1.0%	11.5%	0.8%	3.8%	2.3%	0.0%	0.0%	16.7%	5.0%	0.8%	22.0%	9.2%	100.0%
	(tonnes)		17,958	665	7,649	532	2,501	1,497	0	0	11,108	3,326	532	14,633	6,112	
6 Trade: Retail	(%)	1.48	23.5%	11.0%	29.0%	3.5%	3.0%	0.3%	6.2%	0.1%	5.1%	11.6%	0.8%	1.4%	4.5%	100.0%
	(tonnes)		7,973	3,740	9,827	1,172	1,005	112	2,117	35	1,734	3,942	265	483	1,535	
7 Financial, Insurance	(%)	0.23	9.3%	2.1%	51.4%	3.4%	2.6%	2.0%	1.3%	0.6%	7.6%	7.9%	0.7%	1.9%	9.2%	100.0%
& Real Estate	(tonnes)		322	73	1,770	117	91	68	46	21	262	271	24	65	317	
8 Services:	(%)	0.71	7.4%	5.8%	30.0%	2.8%	10.2%	11.3%	0.5%	0.2%	9.2%	10.0%	5.8%	2.3%	4.6%	100.0%
Non-Commercial	(tonnes)		1,416	1,118	5,773	548	1,961	2,173	87	44	1,766	1,924	1,119	436	878	
9 Services:	(%)	1.09	12.3%	3.2%	27.7%	9.4%	6.5%	3.8%	2.8%	0.7%	5.8%	22.4%	0.8%	1.5%	3.1%	100.0%
Commercial	(tonnes)		4,804	1,273	10,864	3,702	2,542	1,496	1,107	279	2,254	8,764	307	578	1,213	
10 Public	(%)	0.29	10.0%	0.0%	38.0%	5.0%	3.0%	1.9%	0.0%	0.0%	7.0%	2.0%	0.0%	0.0%	33.1%	100.0%
Administration	(tonnes)		137	0	519	68	41	25	0	0	96	27	0	0	452	
Total Waste	(tonnes)		50,876	11,432	65,840	8,977	26,873	15,822	3,734	482	29,531	22,025	3,038	40,503	25,961	305,094
Composition	(% total)		16.7%	3.7%	21.6%	2.9%	8.8%	5.2%	1.2%	0.2%	9.7%	7.2%	1.0%	13.3%	8.5%	100.0%

Table N-4

Estimated Unit Generation Rates and Waste Composition
for Major SIC Groups for Peel Region
1992

Major IC&I Group		Unit Generation Rate (t/emp/year)	1 OCC	2 ONP	3 Paper	4 Glass	5 Ferrous	6 Non-Ferr.	7 HDPE	8 PET	9 Plastic	10 Food	11 Yard	12 Wood	13 Other	Total
1 Primary	(%)	0.86	13.7%	0.0%	7.2%	0.0%	18.2%	14.2%	0.0%	0.0%	3.8%	0.0%	0.0%	20.6%	22.3%	100.0%
	(tonnes)		328	0	173	0	437	341	0	0	91	0	0	496	535	
2 Manufacturing	(%)	1.43	15.1%	2.9%	18.5%	2.0%	12.9%	6.4%	0.2%	0.1%	9.7%	5.9%	0.6%	15.0%	10.7%	100.0%
	(tonnes)		30,333	5,900	37,092	3,986	25,899	12,893	476	152	19,536	11,804	1,267	30,099	21,488	
4 Transportation/	(%)	1.10	14.1%	5.9%	27.5%	3.5%	16.3%	12.4%	0.9%	0.4%	10.9%	1.8%	0.3%	3.5%	2.6%	100.0%
Communication/ Utilities	(tonnes)		4,439	1,867	8,680	1,092	5,136	3,926	278	132	3,447	565	106	1,092	808	
5 Trade Wholesale	(%)	1.27	27.0%	1.0%	11.5%	0.8%	3.8%	2.3%	0.0%	0.0%	16.7%	5.0%	0.8%	22.0%	9.2%	100.0%
	(tonnes)		21,927	812	9,339	650	3,055	1,832	0	0	13,563	4,061	650	17,867	7,458	
6 Trade Retail	(%)	0.89	24.8%	11.6%	27.4%	3.8%	3.1%	0.4%	6.1%	0.1%	4.3%	11.3%	0.7%	1.5%	4.9%	100.0%
	(tonnes)		7,513	3,511	8,299	1,154	937	115	1,844	32	1,300	3,426	206	466	1,491	
7 Financial, Insurance	(%)	0.18	8.8%	2.1%	53.5%	3.8%	2.1%	1.5%	1.6%	0.8%	8.4%	7.8%	0.4%	1.1%	8.1%	100.0%
& Real Estate	(tonnes)		489	114	2,957	209	114	85	86	43	466	433	23	63	448	
8 Services	(%)	0.79	6.6%	4.8%	30.0%	1.7%	11.2%	11.5%	0.2%	0.1%	10.1%	10.0%	6.7%	1.0%	6.0%	100.0%
Non Commercial	(tonnes)		1,289	937	5,867	342	2,192	2,253	39	19	1,985	1,956	1,312	193	1,172	
9 Services	(%)	0.87	12.0%	3.9%	28.4%	9.6%	6.6%	4.1%	2.9%	0.7%	5.9%	21.4%	0.6%	0.9%	2.8%	100.0%
Commercial	(tonnes)		5,355	1,761	12,679	4,277	2,960	1,831	1,310	322	2,623	9,569	279	401	1,256	
10 Public	(%)	0.27	10.0%	0.0%	38.0%	5.0%	3.0%	1.4%	0.0%	0.0%	7.0%	2.0%	0.0%	0.0%	33.6%	100.0%
Administration	(tonnes)		145	0	550	72	43	20	0	0	101	29	0	0	487	
Total Waste	(tonnes)		71,818	14,902	85,637	11,781	40,774	23,297	4,034	701	43,112	31,842	3,842	50,677	35,142	417,559
Composition	(% total)		17.2%	3.6%	20.5%	2.8%	9.8%	5.6%	1.0%	0.2%	10.3%	7.6%	0.9%	12.1%	8.4%	100.0%

Table N-5

Estimated Unit Generation Rates and Waste Composition for Major SIC Groups for Halton Region 1992

	Major IC&I Group		Unit Generation Rate (t/emp/year)	Waste Composition 1 OCC	2 ONP	3 Paper	4 Glass	5 Ferrous	6 Non-Ferr.	7 HDPE	8 PET	9 Plastic	10 Food	11 Yard	12 Wood	13 Other	Total
1	Primary	(%)	0.30	21.0%	0.0%	8.9%	0.0%	14.9%	7.2%	0.0%	0.0%	1.1%	0.0%	0.0%	30.1%	16.8%	100.0%
		(tonnes)		104	0	44	0	74	36	0	0	5	0	0	149	83	
2	Manufacturing	(%)	0.92	13.0%	3.3%	16.5%	2.2%	15.7%	7.4%	0.2%	0.0%	8.7%	3.4%	0.8%	16.4%	12.4%	100.0%
		(tonnes)		4,358	1,095	5,540	747	5,254	2,489	53	11	2,910	1,133	263	5,488	4,138	
4	Transportation/	(%)	0.56	14.0%	5.5%	26.3%	3.2%	15.2%	11.4%	0.8%	0.4%	11.7%	1.8%	0.3%	3.7%	5.6%	100.0%
	Communication/ Utilities	(tonnes)		371	147	698	86	402	302	22	10	310	47	8	98	148	
5	Trade: Wholesale	(%)	0.77	27.0%	1.0%	11.5%	0.8%	3.8%	2.3%	0.0%	0.0%	16.7%	5.0%	0.8%	22.0%	9.1%	100.0%
		(tonnes)		2,383	88	1,015	71	339	203	0	0	1,474	441	71	1,942	799	
6	Trade: Retail	(%)	0.72	24.4%	11.6%	28.0%	3.8%	2.9%	0.4%	6.1%	0.1%	4.6%	11.8%	0.7%	1.4%	4.3%	100.0%
		(tonnes)		2,107	1,001	2,421	326	252	31	524	7	401	1,023	64	117	372	
7	Financial, Insurance	(%)	0.10	8.2%	2.0%	56.1%	4.3%	1.4%	0.7%	1.9%	1.0%	9.1%	8.0%	0.1%	0.2%	7.1%	100.0%
	& Real Estate	(tonnes)		390	96	2,678	204	65	36	91	46	436	380	4	11	338	
8	Services:	(%)	0.58	6.3%	4.4%	30.0%	1.3%	11.6%	11.6%	0.1%	0.0%	10.5%	10.0%	7.1%	0.5%	6.6%	100.0%
	Non-Commercial	(tonnes)		283	197	1,351	59	523	523	4	2	475	450	318	21	296	
9	Services:	(%)	0.55	13.0%	2.8%	25.9%	10.2%	5.9%	3.1%	2.7%	0.7%	5.4%	24.7%	0.8%	1.6%	3.0%	100.0%
	Commercial	(tonnes)		1,225	268	2,433	959	558	295	255	65	510	2,319	76	147	286	
10	Public	(%)	0.16	10.0%	0.0%	38.0%	5.0%	3.0%	1.6%	0.0%	0.0%	7.0%	2.0%	0.0%	0.0%	33.4%	100.0%
	Administration	(tonnes)		169	0	642	84	51	27	0	0	118	34	0	0	565	
	Total Waste	(tonnes)		11,389	2,892	16,822	2,536	7,518	3,941	950	141	6,640	5,827	804	7,972	7,024	74,457
	Composition	(% total)		15.3%	3.9%	22.6%	3.4%	10.1%	5.3%	1.3%	0.2%	8.9%	7.8%	1.1%	10.7%	9.4%	100.0%

SCHEDULE O

INFORMATION ON CURRENT IC&I WASTE DIVERSION ACTIVITIES

SCHEDULE O-1
General Overview of Private Sector Haulers and Recyclers in GTA

Management of IC&I waste in the GTA is carried out mostly by private sector haulers, recyclers, brokers and processors, and material is sold to end markets both within and outside the GTA. An overview of the industries which provide IC&I waste management services is presented below.

Note that a large majority of the waste haulers in the GTA are able to provide some sort of recycling collection service for their customers.

Waste Haulers

The waste hauling industry in the GTA can be divided into 3 categories by company size, level and location of service. The range of materials collected by recycling companies that service the GTA IC&I sector primarily include: OCC, mixed office paper, metal food and beverage cans, glass bottles, plastics (rigid and flexible), and wood waste.

Large Companies

The largest group of haulers operating in the GTA represent three of the largest multi-national waste hauling companies in North America. Waste Management Inc. (WMI), Browning-Ferris Industries (BFI) and Laidlaw Waste Systems are the most dominant haulers in the GTA. Each of these companies provides a wide-range of waste collection services to the IC&I sector. These services include:

- *containerized service* – provision of 20, 30 and 40 cubic yard (cy) containers and compactors (if requested) to customers. Containers are collected by a dedicated truck which services one container at a time;

- *front-end loader service* – provision of containers from 2 to 10 cy capacity and compactors (if requested) which are serviced with a front-end loader truck. The truck can collect from up to 30 accounts before becoming filled;

- *rear-packer service* – provision of collection service to customers using a rear packer truck. The truck collects from customers who do not have the space, accessibility or volume of waste to effectively use a container. Waste is manually loaded into the truck

Both Laidlaw and BFI provide recycling programs promoting source separation. Recycling containers (e.g. roll-out carts) are provided to customers for in-house collection of recyclables. These containers are then collected by the hauler on a regular or call basis. The hauler collects the recyclables with a separate truck and usually charges the customer a monthly or per pickup fee.

WMI operates a different type of program that does not require extensive source separation. The customer is asked to separate waste into dry (e.g. paper, OCC, glass, cans, plastics etc.) and wet (e.g. food and bathroom) waste. WMI collects the materials separately using conventional garbage collection equipment. The wet fraction is sent for disposal and the dry fraction is sent to the Recycle Canada (WMI's recycling company) facility in Etobicoke where the recyclables are mechanically and manually recovered for recycling.

These companies tend not to service the construction, renovation and demolition industry. Materials are usually taken for processing in a private MRF, except in the case of high volume materials such as wood and OCC. These high volume materials are collected in containers provided by the hauler and taken directly to a processor or end market.

Middle Level Companies

The second level of waste haulers can best be described as regional haulers that provide a similar level of service, but individually do not have the same customer base. Also included are large recycling companies that specialize in one type of material. The haulers tend to provide a multi-material service, similar to Laidlaw or BFI, whereas the large recycling companies tend to handle a more limited number of materials that are associated with their business interests.

This second level of haulers number between 10 and 20 companies and have the ability (i.e. equipment) to provide a range of collection services to clients such as containerized, front-end loader and rear-packer services. Examples of these types of companies include: Philips Environmental, Miller Waste Systems, L.W. Sanderson, York Disposal, Wasteco, Pak-Man/Tower Disposal, Select Disposal Services, Canadian Disposal Services and U-Pak Disposal. Examples of the large recycling companies in this category include Domtar, Atlantic Packaging, Alcan Recycling, and large scrap metal companies such as Triple M Metals.

These companies tend to work on a more regional basis, but usually have clients in a number of GTA municipalities. For example, Miller is heavily involved in York and Durham regions, while Sanderson is more focused in Peel and Halton.

Third Level Companies

Third level companies are characterized by being smaller and independent, with a more limited level of service and customer base. They provide a range of services that may handle a wide range of recyclables but exclude regular garbage. These companies tend only to provide containerized services to heavy industrial, large commercial (require container and/or compactor) accounts, and are very active in the construction, renovation and demolition industry.

Some examples of these types of companies include Cougar Disposal, Romano Disposal, J&F Disposal, Cardinal Waste, Via Disposal, R&R Haulage, Metro Waste Paper, Turtle Island, Enviro-Glass, The Paper Option, HGC Management, AAA Recycling and Office Waste Management.

Profile of GTA Recycling Companies

There are over 220 private sector companies providing a range of hauling, processing and marketing services for IC&I wastes in GTA. A complete listing of all IC&I recycling companies in GTA is available through the Recycling Council of Ontario. A profile of the number of companies covering the range of IC&I waste materials is provided in Table O-1.1 (RCO, 1992):

Description of a Selection IC&I Processing Facilities in GTA

A description of all of the processing facilities in GTA is not included in this report. A number of facilities are described however, to illustrate the size and range of facilities in existence. These are organized by the materials handled. A selection of IC&I processing facilities in GTA is presented in the brief description below.

Food Wastes:

Barrets Pig Farm is located in Brooklin. This farm has capacity to receive up to 4,000 tonnes food and organic waste annually.

Hy Hope Farms is a hog farming operation which utilizes food waste from restaurant, hotels and cafeterias as a food source. The facility's stated capacity is 1,200 tonnes.

Construction and Demolition Wastes:

Elirpa Construction Materials operates a concrete crushing operation in Pickering. The facility has an estimated capacity of 100,000 tonnes of concrete waste annually.

Hamden & King Construction is a construction waste facility that has capacity to receive up to 14,000 tonnes of asphalt and concrete per year. It is located in Brooklin.

Bennet Paving in Oshawa is a manufacturer of asphalt paving which had a stated capacity of 35,000 tonnes of concrete waste to be mixed with 25,000 tonnes of reclaimed asphalt in 1992.

Drywall Scrap Co. is a depot accepting scrap drywall, located in Oshawa. It has capacity to receive up to 2,400 tonnes annually.

Table O-1.1

Estimated Number of GTA Recycling Companies Involved in Management of Different Materials, 1992

Material	Number of GTA Companies that Haul, Process, Market the Material*
Asphalt and Concrete	21
Construction & Demolition	19
Drum Reconditioning	10
Drywall	24
Food & Beverage Cans	31
Food & Organic Waste	20
Glass	22
Scrap Metal Recovery	57
Paper Products	89
Plastics	68
Social Service Organizations	9
Textiles	9
Tires	18
Wood	63

*Note: the number of services shown adds to greater than the total of 220 because several companies provide multiple services.

Source: Recycling Council of Ontario, *Secondary Material Markets Directory*, 1992.

Queensway Recycling is a new facility located in Etobicoke. A joint venture between Cardinal Waste and Teperman Demolition, the facility receives C&D and IC&I wastes and recovers mixed office paper, OCC, wood and drywall.

Harkow Aggregates and Recycling is located in the Toronto harbourfront area. Harkow operates a C&D processing and transfer operation with an operating capacity of 150,000 tonnes per year. The company manually separates wood, metals and OCC to achieve a 7% to 15% diversion of materials accepted. The tipping fee charged for mixed C&D waste is $97 per tonne.

Conwaste operates a C&D and IC&I waste processing and transfer operation in Mississauga. Through manual separation, wood waste and OCC are recovered and sent to markets. The facility handles approximately 50,000 tonnes of materials per year.

Teperman operates a processing facility for their own demolition wastes. Brick and concrete, wood and metals are separated manually and with front-end loaders.

Canadian Eagle Recyclers is located in Markham. Canadian Eagle is affiliated with Greenspoon Demolition and operates a mixed C&D processing and transfer operation. Manual separation is utilized to recover wood, drywall, metals, OCC and used carpet materials. Canadian Eagle further processes wood waste on-site. The operation has an operating capacity of approximately 75,000 tonnes per year.

Several paving manufacturing operations utilize reclaimed asphalt and concrete wastes in the production of new asphalt paving. Two examples of these include **Fermar Asphalt** in Etobicoke and **Warren Bitulithic** in Downsview.

Traditional IC&I Recyclables (Cans, Bottles, OCC, Office Papers, etc.)

Courtesy Transfer operates a transfer operation for IC&I wastes where selected materials such as OCC, wood, plastics and other papers are removed prior to transfer. The Mississauga facility has an estimated capacity of 130,000 tonnes per year.

Harrison Disposal operates a waste transfer and sorting operation in Brampton which has a capacity of 15,000 tonnes per year. The facility handles mixed IC&I recyclables. Most of the material handled by the facility is likely to have been generated in Peel Region.

L.W. Sanderson operates a waste transfer and sorting operation in Brampton which has an estimated annual capacity of 100,000 tonnes of dry IC&I recyclables and residential Blue Box materials.

Waste Management of Canada Inc. operates a mixed waste sorting and transfer operation in Etobicoke. This facility began operation in 1991 to process select, source separated IC&I recyclables (OCC, wood, mixed papers, metals, glass and plastics) primarily from WMI customers (although the facility is open to other haulers who are able to provide the same quality of material). The facility has the ability to process 400 tonnes/day of mixed waste and is limited to a daily residue quantity of 200 tonnes. Current diversion of incoming waste is estimated at 50% - 55%.

Laidlaw operates a large MRF in Mississauga which processes all the material collected from the municipal curbside and apartment recycling programs in Mississauga and Brampton. In addition, materials from the approximately 2,000 IC&I locations that are recycling in the GTA are processed at the MRF. The materials handled include mixed paper, OCC, metal cans, glass and polystyrene. The facility currently handles approximately 28,000 tonnes/yr of municipal material, and 12,000 tonnes/yr. of IC&I material. Laidlaw is constructing a new MRF/transfer station on the same site with a capacity of 200 tonnes/yr.

Miller Waste Systems operates a large operation in Markham which includes an IC&I processing facility, with the ability to handle wood waste, drywall, concrete and asphalt waste. Miller lists materials accepted in Metro's market directory as OCC, ONP, mixed office paper, metal cans, glass and most plastics.

Browning-Ferris Industries (BFI) operates a MRF in Concord for IC&I customers. BFI declined to provide additional information, however, BFI lists in the Metro Toronto Markets Directory under materials handled OCC, mixed office paper, beverage cans, glass and wood.

Prowaste, in cooperation with Browning-Ferris Industries (BFI), operate an IC&I MRF in Mississauga. The facility has an estimated capacity of 50,000 tonnes, and handles OCC, office paper and wood wastes.

The Recycler Inc. operates a sorting and processing operation for IC&I recyclables such as mixed office paper, metal cans and glass. The facility is located in Concord.

Waste Papers:

Domtar operates a paper fibre sorting and processing operation in Etobicoke. The facility receives primarily OCC and office papers from haulers and paper generators. The papers are sorted by grade and baled for shipping to Domtar facilities and other markets. The facility capacity is estimated to be 75,000 tonnes of paper fibres. Domtar also operates a liner board manufacturing facility in Brampton which utilizes OCC in the manufacture of new cardboard containers.

Metro Waste Paper operates a sorting and processing operation in Scarborough which handles all grades of paper, metal cans, glass bottles and pallets.

Turtle Island services the IC&I sector and collects mixed office paper, metal cans and glass. It operates a small sorting and processing operation in Etobicoke.

Specialized Wastes:

Thermal Waste Reduction (TWR) operates a facility in Scarborough which operates a thermal screw press. The machinery has been used for a number of applications including the processing of wood waste and tires.

Lennox Drum Ltd. is a drum reconditioning facility that has capacity to receive up to 10,400 tonnes of steel and plastic drums annually. It is located in Ajax.

National Rubber Co. has been using recycled tires in the manufacture of various rubber products since 1927. In 1992, the company consumed approximately 22,500 tonnes of tires. National Rubber is expanding their operations to handle a total of 45,000 tonnes of tires from Ontario by 1997.

Alcan Recycling operates a processing operation in Brampton which handles primarily aluminum cans collected through the Brewers' Retail (BRI) and municipal curbside collection programs. Alcan also handles and processes glass and cans collected from IC&I customers, plastics from the BRI and other packaged beverages.

Wood Conversions Inc. (WCI) is a wood processing operation located in Brampton. The facility receives mixed and clean loads of wood waste and processes the wood through a series of chippers and screens to produce a consistent sized wood chip. The facility has an estimated capacity of 23,000 tonnes of wood waste per year. Most of the material handled by the facility is likely to have been generated in Peel Region.

The Canadian Polystyrene Recycling Association (CPRA) operates a sorting and processing facility in Mississauga. The facility receives polystyrene from large generators (e.g. automotive manufacturers), haulers and municipalities for processing and eventual sale to plastic manufacturers. The estimated annual capacity is 25,000 tonnes per year. In 1992, the facility processed 864 tonnes from the IC&I sector, including 186 tonnes of foam and rigid plastics from food service establishments. (*Recycled Plastics Update*, 1992).

Knowaste Technologies has recently established a facility in Mississauga that processes used diapers and sanitary napkins from hospitals and nursing homes.

IKO Industries in Brampton use wood waste and OCC in the manufacture of roof felt and shingles. The facility has expanded capacity to handle 30,000 tonnes of wood waste in 1993.

Westroc is a drywall manufacturer which purchases recycled gypsum from New West Gypsum in Oakville. The recycled gypsum is used in the manufacture of new drywall sheeting.

Waste Exchange, and Reuse,

Various facilities provided exchange services (e.g. Ontario Waste Exchange, local waste exchange program in Durham, the Re-Uze Centre, Scarborough, WASTEWISE, Halton, etc.)

The Ontario Waste Exchange (OWE) assists waste generators to identify markets for their waste materials. In 1992, OWE handled approximately 56,000 tonnes of materials. The proportion of these generated by GTA companies is not known. Since start-up in 1987, OWE has handled a total of roughly 222,000 tonnes of waste materials in the Province of Ontario (OWE, 1993).

Survey of Recycling Companies

A representative number (approximately 60 of the 220) of companies providing a range of hauling, processing and marketing services in GTA were selected for a survey to determine quantities of material handled in 1992 (the survey questionnaire and covering letter from MOEE are included at the end of this Section). Of the 60 target companies 54 companies were reached, and 37 participated. Most private haulers and recyclers contacted were unwilling to divulge proprietary information concerning their operations and capacities, however, indications of recycling activity for some materials were provided. Information was obtained from two of the largest companies, 5 middle-level and 30 small hauling and recycling companies.

Of the 54 companies contacted, 28 companies provided data on the tonnages of materials diverted in 1992. The 28 responding companies diverted an estimated 633,000 tonnes of waste in GTA in 1992. A similar number provided information on the number of IC&I accounts handled in 1992. The total number of accounts handled by approximately 28 responding companies was roughly 14,000. Of the 54 companies contacted, 31 reported employing 860 people. Table O-1.2 summarizes these results.

Table O-1.2
Summary of the Results from
Survey of Recyclers/Haulers in GTA
May - July, 1993

No. Company	No. Accts	Tonnes/yr	No. Empl	No. Vehic	Tonnes/acct	tonnes/empl
1	20	2,231	28	0	112	80
2	1000	18,500	15	[illegible]	19	[illegible]
3	75	43,600	7	7	581	[illegible]
4	20	460			23	0
5	18	3,000			167	[illegible]
6			10	3	0	0
7	400	2,400	7	2	[illegible]	343
8		100			0	0
9	2,500	[illegible]	22	4	4	[illegible]
10	50	109,000	33	3	[illegible]	3303
11	200	7,300	25	4	37	292
12	8	12,000	3	3	1500	[illegible]
13	100	4,500	1	[illegible]	45	4500
14	500	33,000	50	6	66	660
15	200	130,000	25	20	650	5200
16			7	4	0	0
17	120	100	3	1	1	33
18					0	0
19	80	130	1	1	2	130
20	20	1,800	10	3	90	180
21	20	900	2	1	45	450
22	60		6		0	0
23	5,000		200	10	0	0
24	1,300	119,500	149	16	92	802
25	150	33,000	30	5	220	1100
26	30	1,500	6	2	50	250
27					0	0
28	35		13	5	0	0
29		15,000	35		0	429
30	200	180	30	12	1	6
31	300	140	3	2	0	47
32	250	[illegible]	12	3	8	[illegible]
33		62,500	65		0	[illegible]
34					0	0
35	150	[illegible]	1	3	13	2000
36	120	15,300	45	10	128	[illegible]
37	800	3,400	16	4	4	[illegible]
Total	[illegible]	[illegible]	[illegible]	141	[illegible]	[illegible]

Notes:

[illegible]

GREATER TORONTO AREA
PRIVATE SECTOR RECYCLER'S SURVEY

Company_________________________________

Contact Name_____________________________

Phone #_________________________ **Date:**______________________

1. How many accounts does your company provide recycling collection and processing services in the industrial/commercial & institutional (IC&I) sector (i.e. non-residential) in the GTA?

3. Of these, how many are multi-material accounts (i.e. collecting more than one material)?

3. How much material (in tonnes) did your company handle from the GTA in 1993?

4. How many total accounts are projected for 1994?

5. What material does your company usually collect from IC&I accounts (e.g. office paper, cardboard, wood, cans, glass etc.)?

6. Does your company process recyclables (i.e. sort, bale, ship to market) and if so, what materials?

7. Does your company, or parent company, haul waste to landfill/transfer stations?

8. What percentage of your recycling business is in the Greater Toronto Area (Halton, Peel, Metro Toronto, York or Durham)? Is your business concentrated in any particular area?

9. How many employees does your business employ (part and full-time)?

10. Does your company operate a fleet of collection vehicles? If so how many?

11. Have the recently announced Ministry of the Environment requirements for IC&I establishments to conduct waste audits and implement source separation programs affected your business? Do you expect this to change in the future?

12. Has your business been impacted by waste exports?

13. Do you think reduced tipping fees in the GTA will have any impact on your business?

14. Are you experiencing any problems with any of the end markets for materials in which you handling?

Please Return to: Gordon Day, RIS Ltd – Phone (480-2420) Fax (480-2419)

Ontario
Ministry of the Environment and Energy
Ministère de l'Environnement et de l'Énergie

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May 19, 1993

To whom it may concern:

Please accept this letter of introduction for Resource Integration Systems (RIS) Ltd. which is working on behalf of the Ministry of Environment and Energy on a study of the waste diversion potential and socio-economic impact of the 3Rs within the Greater Toronto Area.

As part of this study we are gathering the most recent information available from various sources. We would appreciate your cooperation in our study and would like to assure you that all information that you will provide will be amalgamated with other data collected in such a manner that proprietary information will be protected.

Should you have any questions, please feel free to contact me at (416) 323-4561.

Yours sincerely,

Orna Salamon

Orna Salamon
Technical Coordinator
3Rs GTA Study

References

Recycling Council of Ontario, *Secondary Material Markets Directory*, 1992

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SCHEDULE O-2

Surveys of Current IC&I Waste Diversion Activities

General

The purpose of this portion of the study was to collect available information on waste diversion initiatives in the IC&I sector in the GTA. Since data on waste generation was allocated to ten major industrial/commercial sectors, as detailed in Chapter 5, therefore industrial/commercial establishments and associations were surveyed according to each of these ten sectors. The ten major sectors were:

1. Primary
2. Manufacturing
3. Construction
4. Transportation/Communication/Utilities
5. Wholesale
6. Retail
7. Finance, Insurance, Real Estate
8. Non-Commercial Services (health care and education)
9. Commercial Services
10. Public Administration (incl. government)

Information was gathered from published articles, documented success stories and previously produced studies. The Study Team carried out telephone surveys in February and March 1993 of IC&I associations representing each industry group as well as individual generators and staff at each GTA Region.

GTA Regions/Municipalities

Most of the GTA municipalities have been unable to provide accurate figures on quantities of IC&I waste being diverted, for the following reasons:

- the number of IC&I establishments in any given region or municipality is so large that it is impossible to monitor them all;
- the majority of IC&I waste is collected by a large number of private haulers which has made accurate data collection difficult;
- haulers have not provided municipalities with figures on ICI waste types or quantities being collected in their regions;
- a large portion of ICI waste has been exported to the U.S. since 1991 and accurate figures on amounts are difficult to obtain.

All regions, with the exception of York, have established extensive programs to assist the ICI sector to implement 3Rs programs and identify markets for recyclable materials. Literature, posters and videos are provided. Advisors are available to assist companies with waste audits and developing reduction programs. Each region publishes a directory of recyclers within to assist IC&I operations to identify markets for recyclable materials.

Diversion figures and specific information reported by the individual regions are presented below.

The Region of Durham

The following 1992 diversion figures reported by the Region of Durham represent annual waste totals obtained by doubling reported diverted quantities between Jan. 1 - June 30, 1992:

- fine paper, used beverage cons and ONP — 581.38 tonnes (.18%)
- company reported diversion — 48,306.00 (14.94%)

The region operates a recycling center which reported receiving the following amounts of ICI waste in 1992:

Fine Paper	228 tonnes	(1.1%)
Cardboard	161 tonnes	(0.8%)
Mixed (paper, glass, metal)	138 tonnes	(0.7%)

The region also conducted a survey to determine how many companies would require in assistance. Nine percent responded and of those companies, 70% indicated an interest in establishing programs (Collis, 1993).

The Region of Halton

The Region of Halton has little information on IC&I waste diversion activities and the majority of IC&I waste from the region is presently exported. No figures on exported quantities are available. The region's MRF accepted 2,684 tonnes of cardboard from the IC&I sector in 1992 (Smith, 1993).

It is estimated that 13,000 - 20,000 tonnes of waste was diverted by the IC&I sectors in the Region of Halton in 1990 (Smith, 1993).

The region's "Waste Wise" program assists companies to locate markets for recyclable materials and provides advisory services to numerous businesses on developing 3Rs programs. Since its inception in 1990, the program has led to the diversion of 59 tonnes of paper, 40 tonnes of reusable appliances, tools and furniture, 8 tonnes of used clothing and 1 tonne of plastic.

The Region of Peel

The Region of Peel estimated that in 1990, waste diverted from landfill was 118,101 tonnes, or 25% of ICI waste generated (Morgan-Fraser, 1993). It is estimated 128,855 tonnes were diverted in 1990 (MacLaren Engineers, 1991).

The region's landfills took in 227,301 tonnes of IC&I waste in 1991 and it is estimated 53,125 tonnes were exported for disposal (Morgan-Fraser, 1993). From programs such as material bans at landfill, the region's waste exchange, waste assessments, the clean fill referral service and an approximate survey of recyclers and haulers conducted in 1991, the region estimated that approximately 369,302 tonnes were diverted from landfill in 1991 (Morgan-Fraser, 1993). This represents a 57% waste diversion rate.

The region expressed concern that estimates for both years are not reliable. Included in these quantities is an estimate of exported waste. In addition, the region's recyclers could only provide estimates as to the percentage of the material they process actually comes from within the region. Finally, many recyclers or haulers contacted did not provide the information requested. At best, the survey is a partial sampling (Morgan-Fraser, 1993).

The region extensively promotes ICI diversion. Programs include: a general recycling hotline that also accepts IC&I questions; an annual day-long seminar, including presentations and awards for outstanding achievements in waste reduction, to encourage IC&I waste reduction; publishing a recycling markets directory and liasing with industry associations to promote 3Rs programs and providing research and development assistance for companies with new waste reduction initiatives.

One hundred and forty-seven waste audits were performed by regional staff by 1991, in addition to visits advising companies on the 3Rs. Approximately 10,000 posters were distributed to the IC&I sector to encourage businesses to become environmentally-friendly. While Peel Region advertises its own 3Rs programs, education programs in the schools are conducted with the help of a Joint Committee for the Environment of the Separate and Public Boards of Education of Peel.

Metropolitan Toronto

The estimated Metro Toronto IC&I diversion (excluding) public facilities for 1990 was 219,543 tonnes. This amount was not necessarily recycled, however, and could have been exported (MacLaren Engineers, 1991).

Metro Works reported that in 1992, 200,015 tonnes of ICI waste was landfilled. Metro has also estimated that between 500,000 and 900,000 tonnes have been exported from Metro for disposal (Metro Works Dept., 1993).

1992 waste diversion totals and 1993 projections for Metro offices, as well as general IC&I soil recycling are presented in Table O-2.1.

Table O-2.1
Metro Toronto Waste Diversion Totals

Waste Diversion Program	1992 Diversion	1993 Projected Diversion
Agencies, Boards, Commissions and Metro Departments	8,300	10,000
Soil Recycling*	56,600	75,000

*Assumed majority of soil originates from ICI sites

The City of Toronto Public Works department indicated that:

- in the fall of 1991, material recovery services were begun in 2,500 restaurants and 6,000 retail stores;
- paper recovered from City operations in 1991 increased by almost 50% over 1990, largely due to extension of program to all city offices;
- developers submitted 83 waste reduction and material recovery plans in 1991, bringing to 168 the number of new plans approved for new developments since 1988. When these properties are in full operation they will have average diversion rates of 40% and will divert about 22,000 tonnes per year from landfill. This is not diversion of existing quantities of generated waste (City of Toronto, 1992).

Other information on general initiatives undertaken by Metro in the ICI sector are as follows:

Metro council approved the establishment of depots at selected facilities to receive source separated recycled materials including OCC, glass, cans, plastic, newspapers, telephone books, drywall, leaves, yard waste, tires, scrap metal, wood, and office paper for small companies unable to arrange collection by private recycling companies (MacLaren Engineers, 1991).

Over 300 waste audits were conducted in 1990. Metro Toronto also produced a guide to develop a commercial and industrial waste reduction and recycling plan; a market directory of facilities recycling banned materials; an office paper recycling

guide; and an educational kit for schools. Metro also set up an IC&I information hot line which handled 6,000 inquiries in 1991 (MOEE, WRO, 1992). Discussions with Metro have revealed that the hot-line is now receiving only 400 calls per month(Garland, 1993).

Table O-2.2 provides a breakdown of IC&I materials recovered in City of Toronto municipal recycling programs:

Table O-2.2
Material Recovery in City of Toronto Recycling Programs
(Confidential Source)

Program	Materials Collected	Quantities (metric tonnes)			
		1988	1989	1990	1991
Commercial (Retail stores, restaurants etc.)	Corrugated Cardboard	141	1,060	1,302	1,855
	Glass bottles and jars (same as res. blue box)	83	679	811	1,598
Fine Paper - City Hall and other city offices	Fine paper (photocopier, laser printer paper, memo paper etc.) Includes newspaper	33	147	378	561

In 1992, 38 tonnes of newspaper and OCC and 361.3 tonnes of office paper were recovered from City Hall and other City owned buildings (Confidential Source).

Region of York

York was unable to report any specific diversion numbers. The region's charter prohibits regional government from engaging in private solid waste management.

Surveys of Associations and Generators

This section will summarize information obtained through a telephone survey of a number of industry associations carried out in February and March 1993.

Ontario Waste Management Association (OWMA)

The association conducted a survey of members in the GTA in March, 1991. The number of companies responding was 22. The results indicated that the number of tonnes collected was 186,986 per month and of that total, 33,316 tonnes/month were recycled. That translated into a recycling rate of 17.8% for waste collected. The survey also asked members to estimate collection and recycling numbers for six months from the survey date (September 91). They estimated that tonnes collected and recycled would be 210,077/month and 49,934/month respectively, for a 23.7% recycling rate. The survey did not include information from one large company which operates in the GTA. However, the results are considered a good estimate of activity in 1991.

In an information release in March, 1993, the association indicated its members handled 80% of all IC&I waste generated in Ontario. A survey to be completed in June, 1993 is being conducted to determine recycling levels and will be the best source of data from the association.

Canadian Federation of Independent Business (CFIB)

The association is comprised of independently owned (not publicly traded) companies. It has approximately 4,000 members in Metro Toronto. Total membership for the entire GTA could be as high as 8,000, although no firm figures are known. The federation represents about 10% of independent businesses in Canada. Its membership is broadly based and reflects industry make-up in the economy as a whole. There is some higher concentration in retail and construction. Its members have an average of 12 employees.

Firms with fewer than five employees account for close to 75% of all businesses in Canada. The amount of waste generated by one company with fewer than five employees has been found to be equivalent to that generated by one household. Firms with over fifty employees generate waste equivalent to eighty-seven households while those with more than 500 employees generate waste equivalent to almost 2,600 households (CFIB, 1990).

In 1991 the federation conducted a survey of its members on environmental issues, (primarily solid waste management practices) and product packaging.

The results reflect the views of 2,300 responding members. While recycling was carried out to varying degrees according to industry, the survey found that:

- 70% of businesses in Canada were doing some level of reuse or recycling;
- 79% of Ontario businesses were engaged in 3Rs;
- 1/3 of respondents indicated 3Rs have led to at least a 20% reduction in waste disposal;
- 1/7 of respondents indicated reductions in excess of 50%.

Table O-2.3 shows the percentage of CFIB survey respondents who reported that they composted, reused or recycled materials in 1991;

Table O-2.3
CFIB Survey Respondents Engaged in Waste Diversion Activities in 1991

Industry	%
Agriculture, Forestry, Fishing	100
Mining	83
Manufacturing	89
Construction	79
Transportation	75
Wholesale Trade	78
Retail Trade	63
Finance, Insurance, Real Estate	33
Services	73
Total	72

LURA Group Reports

In February, 1992 the LURA group released a series of reports on the following IC&I sectors:

- Construction and Demolition;
- Retail and Office;
- Manufacturing;
- Education;
- Food & Hotel Services.

The reports were developed as a result of focus groups formed for each sector. The general conclusions reached were that all sectors are now addressing the waste reduction issue and are developing ideas. Most have not yet carried out waste audits or implemented waste reduction action plans at an association level. Initiatives that have been undertaken are at the individual company level.

An exception, however, are the plastics and packaging industries, both of which are actively engaged in reduction and re-use activities as an industry.

Key findings from the reports were:

- Office & Retail

  — some organizations achieved up to 85% reduction in waste going to landfill

- Food & Hotel Services

  — 60% of waste is non organic
  — 40% organic
  — composting presents an opportunity for significant diversion
  — current composting activity is minimal.

The following sections will summarize available IC&I waste diversion data according to the ten categories used for the study.

Primary Sector

Research to date has not identified information on waste diversion efforts in the primary sector.

Manufacturing Sector

The information presented in this section is divided into activities undertaken by individual waste generators and industry associations.

Information Obtained From Industry Associations

A number of associations were contacted by phone during February and March 1993, as part of this study. The results are summarized below:

Canadian Flexible Packaging Institute

This is a small association, made up of only six members. They were not willing to divulge information, because it may compromise members' trade advantage.

Canadian Manufacturing Association

The association has 2200 members, 70 - 80% of which are located in Ontario. Initiatives are focused more on providing members with information on environmental and waste reduction issues, rather than encouraging or implementing 3Rs programs as an association.

A survey was conducted in 1991 to see how many members had undertaken environmental initiatives. More than half of all respondents indicated that they have corporate environmental policies and action plans in place, up from 45% in the 1990 survey (the exact number of survey respondents was not provided). Over 60% reported that these plans help them reduce waste and increase energy efficiency. Eighty-three percent of respondents reported that they conduct corporate environmental audits of their manufacturing processes and 73% audit their products. Finally, the survey indicated that over a third of respondents have active environmental communication plans focused on employees, shareholders and the public. No figures on waste diversion were requested in the survey.

Canadian Polystyrene Recycling Association

The association operates a plant in the GTA. In 1992 it processed 864 tonnes from the IC&I sector, including 186 tonnes of foam and rigid plastics from food service establishments. (Ulba, CPRA, 1993).

National Apparel Bureau/Dress Guild

No formal industry program exists. Fabric waste is the major waste stream and has been recycled for some time. Therefore, recycling has not led to new waste diversion.

Ontario Furniture Manufacturing Association

The association is down to 85 members. Wood waste, upholstery fabric, leather, foam and plastic wrap are the major waste streams. Members have traditionally recycled or reused these materials and, therefore, no new diversion has been created as a result of these initiatives.

Packaging Association of Canada

Major initiatives are being undertaken. The amount of boxboard used for detergent packaging has been reduced by 40%. It is estimated it could result in a 30,000 - 40,000 metric tonne reduction in boxboard going to landfill in Canada. The association is conducting a survey of NAPP adherents with Statistics Canada to determine what reduction has been achieved by industry.

Paper and Paperboard Packaging Environmental Council (PPEC)

The Railways Association of Canada has approved a package weight reduction of between 5% and 10% for shipping purposes. This could result in potential savings of 100,000 tonnes nationally of corrugated containers used in shipping.

PPEC formed the Boxboard Task Group with OMMRI to make boxboard more recyclable and to increase end use markets. This is being done in conjunction with a pilot project underway in different Ontario municipalities to collect boxboard in curbside recycling programs.

Society of the Plastic Industry/ Environmental Plastics Institute of Canada (SPI/EPIC)

The association has 450 members nationally, two thirds of which operate in Ontario. It is made up of a variety of plastic using industries. The association conducted an ad hoc survey of plastic recyclers in 1991 and found the amount recycled to be:

- 1988 - 14,606 tonnes
- 1990 - 31,165 tonnes

No geographical or residential/IC&I breakdown of the information was provided.

The association formed a Strategy Team Plastics (STP) group in 1992. Its purpose is to create an action plan for diversion. The group is comprised of different task groups, including IC&I and Reduce and Reuse groups. The action plan will be submitted to the Ontario MEE later this year.

Information Obtained From Individual Generators

This information has been obtained from case studies conducted by the Recycling Council of Ontario (RCO), OMMRI, MacLaren Engineers Ltd., SENES Consultants, the Study Team and the Ministry of Environment and Energy. This was supplemented with direct discussions with individual generators. While many of the following individual initiatives were each documented in several of the above sources, the RCO material generally provided the most up-to-date information.

Lever Brothers Discussions with the company revealed that 1991 packaging changes diverted an additional 283 tonnes from landfill over 1990's total diversion. The company has reduced manufacturing waste sent to landfill by 85% since 1991. The following recycling is taking place:

- Pallet recycling - through CPC pallet system;
- Boxboard - pilot programs underway in Markham and Halton;
- Foil, Stretch Wrap, Drums.

General Mills Cereals Group has made plastic liners for boxes 12% thinner. OCC used for transport and boxboard used for cereal boxes are made of 35-40% recycled material (RCO,).

William Neilson Ltd's Toronto plant achieved an 83% reduction in waste sent to landfill between 1988 and 1991. Waste was reduced from 1,740 tonnes/yr to 300 tonnes/yr. Corrugated waste was reduced by 90% (RCO, July/Aug. 1991).

Confidential (food company) reduced waste sent to landfill from its Toronto plants in 1991 by 48% over 1990.

Random House Publishing is recycling OCC, paper, books, wood, cans, bottles and plastics. Randam House has reduced waste disposal by over 90%, diverting over 200 tonnes from landfill (RCO).

Hewlett Packard reduced the volume of waste sent to disposal by 80% by August '91 (RCO).

IBM reduced the amount of waste disposed by approximately 70% by the end of 1990 (RCO).

McDonnell Douglas recycled over 40% of its non hazardous waste stream in 1991 (RCO, 1991).

LePages Ltd. achieved 40% reduction in plant waste in 1991, 3% improvement over 1990 (RCO, 1991).

Astra Pharma of Toronto initiated a plastics recovery program for all of the company's consumer plastic wastes. Recovered 95% of customers' and outlets' plastic wastes. In 1991 an estimated 2 tonnes of material was diverted (RCO).

GM Oshawa Autoplex achieved a 36% reduction in waste sent to landfill between 1989 and 1991. It diverted more than 10,000 tonnes of corrugated cardboard in 1991 (MOEE, 1992).

Boeing DeHavilland in Downsview had reduced waste generation by 49%[1] by the end of 1990 (RIS, 1991).

Ashland Chemicals, Mississauga reduced waste through diversion by 99%(RIS, 1991).

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1 In a report released March, 1993, the WRO indicated that DeHavilland diverted 65% of its total waste from landfill. The total amount diverted was 802 tonnes, the majority of which was made up of steel, aluminum, office paper and wood. The estimate of total waste was 1,478 tonnes. The program was started in 1988.

Construction and Demolition Sector

Refer to Schedule H - Markets, for a description of construction and demolition waste processing facilities and markets. Quantities of waste diverted have been included where available.

Transportation/Communication/Utilities Sector

Information available on this sector was limited. The information obtained was provided by a few individual generators and was obtained through case studies and direct discussions with Bell Canada staff.

The Toronto Transit Commission (TTC) conducted a trial blue box program in December 1988 to collect newspapers. The report the commission issued after the completion of the trial indicated that in the last three weeks of the trial, 4.3 tonnes/week were collected. It was estimated that when the program was fully implemented, a maximum 21.77 tonnes/week or 1,205 tonnes/year of newspapers could be diverted from landfill. This would create a 14% diversion rate. No updated figures have been received (TTC, 1988).

The TTC also offers a plastic recycling program for "Metropasses". Passes can be dropped off at any subway station and are recycled into plastic sewer pipes.

Bell Canada's Zero Waste Program has reduced waste by over 98% in its Fieldway Road office complex which is staffed by over 1,000 employees. Materials recycled include: paper, copper cable, tires, plastics, cardboard and toner cartridges. Waste going to landfill has been reduced from 1,800 lbs/day in 1989 to 25 lbs/day in 1992. The total amount of waste diverted from landfill since the program's inception is 58.5 million lbs. An additional nine Bell facilities of over 10,000 square metres have achieved over 80% reduction. In the GTA, Bell Canada operates 30 facilities with 10,000 employees.

The Bell program emphasizes the 3Rs. For example, paper towels have been replaced by hand dryers and stationery's deposited in a special cabinet for reuse.

Consumer's Gas achieved a 50% reduction of waste from 1989 levels by the end of 1992. Its Waste Management Committee's goal now is to achieve a 75% reduction by 1995 (RIS, 1991).

Municipal wastes included in the Consumer's Gas program are: aluminum cans, batteries, OCC, Boxboard, construction waste (drywall and brick), fine paper, food waste, magazines, newspaper, plastic material (from pipe to foam cups), scrap metal,

soft drink containers, wood and yard waste. A waste management manual has been developed to assist staff in all regions to participate.

Success has been achieved through the emphasis of each of the 3Rs. The company requests that its suppliers reuse skids and remove the blister packaging. Large office supply orders are packaged in boxes and returned to suppliers. Consumer's would now like to develop a zero waste program for its offices.

Pearson Airport is introducing 3Rs programs in Terminals 1 and 2 as well as two service and administrative buildings that Transport Canada controls. Phase 1 is scheduled to be introduced in April or May, 1993 and will include fibres such as office paper, newspapers and magazines. Phase 2 will include beverage containers such as bottles, cans and perhaps polystyrene and is scheduled to be introduced in late summer, 1993. RIS has designed the program and estimates that 610 tonnes per year could be diverted from landfill. This total includes cardboard which is already collected for recycling (RIS, 1991).

The airports flight kitchens are controlled by Cara, Marriot and Steels Aviation. All now recycle cardboard. Cara now has a 34% waste diversion rate. It plans to add steel cans, glass and food waste to the program. Steels Aviation currently recycles these materials with the exception of food waste, and has achieved a 42% diversion rate (WRO, 1993).

Wholesale Sector

Packaging is the major source of waste generated by this sector. A strong emphasis is placed on reduction and reuse. The industry is a major participant in the National Packaging Protocol (NAPP), one of the highest profile waste reduction and reuse initiatives in the commercial sector. Recent published reports have indicated that 55% of industrial packaging waste consists of pallets. While exact figures are not known, the majority of pallets are diverted from landfill (Confidential source). NAPP indicated that it was on course for its 20% reduction goal for the end of '92 (Confidential source).

Retail Sector

Direct discussions were held with a number industry associations. The findings were as follows:

Building Owners and Managers Association

The association has many mall operators as members. It will be providing information by April 1.

Retail Council of Canada

The council commissioned RIS to do a general assessment of packaging issues and priorities. No survey of the membership was done and it did not focus on recycling. Due to the difficult economic time faced by the retail industry over the last few years, recommendations have not yet been implemented.

Toronto Automobile Dealers Association

The association provides information to dealers regarding new environmental regulations. The dealers then undertake appropriate initiatives with haulers.

Canadian Federation of Independent Grocers

The federation endorses all initiatives being developed by the Grocery Products Manufacturers of Canada. It is not undertaking actions of its own.

Grocery Products Manufacturers of Canada

The GPMC (Grocery Products Manufacturers of Canada) which represents 165 manufacturers and sellers of grocery products, proposed a Packaging Stewardship Model in November 1992. This model is a Canada-wide industry based initiative aimed at taking responsibility for the packaging generated by a number of consumer products. It calls for the creation of an industry funded organization to support municipalities in their recycling efforts and to develop markets for recycled materials. The details of this plan have not been released to date.

Information Obtained on Individual Generators

The following information was obtained from published reports from the RCO, LURA Studies and Waste Reduction Office, and describes efforts by individual retail companies.

Trilea Centres has implemented recycling programs at two of its malls, the Bramalea City Centre and "Shops on Steeles" Mall. The Bramalea City Centre distributed blue boxes to all tenants for the collection of cans, glass and fine paper and the program diverted 23 tonnes in the first eight days. No figures were provided for Shops on Steeles (RCO, Sept., 1992).

The Body Shop is offering a bottle refill program for liquid products. Customers bring empty bottles to be refilled with the same product and will be given a discount. The chain is now looking at the feasibility of switching products from tubes to bottles. It is also collecting other used containers for recycling (RCO, June, 1992).

Sears Canada launched a program to recycle 35 million expired catalogues(LURA Group, 1992).

The Bayview Village Shopping Centre has begun a recycling program with AAA Recycling to collect OCC, fine paper, cans, glass bottles, newspaper, plastic, styrofoam, wood and food waste. No diversion figures have been provided (RCO).

The Dufferin Mall has implemented a Blue Box program collecting standard materials, including food waste, fine paper, polystyrene, clothing, coat hangers eye glasses and silicone boxes. Its next step will be to target tissue paper, plastic garment bags and boxboard.

The Dufferin Mall generated 520 tonnes waste in 1991-1992. Of this, 83 tonnes were reused or recycled in 1992. A stated waste management goal is to increase the total to 200 tonnes. In 1992, 4,500 lbs of food waste were sent to Scotts Farms for composting (RCO).

Canadian Tire has implemented an extensive 3Rs program. Details were not available at the time of preparing this document.

Finance/Insurance/Real Estate Sector

This group covers many office buildings in the GTA. Pitney-Bowes conducted a survey of its customers in 1992 which showed that 72% of offices in Ontario have recycling programs compared to only 58% in 1991 and 60% nationally. The survey results are summarized in Table O-2.4.

Table O-2.4
Key Findings of the 1992 Pitney Bowes Survey

ACTIVITY	1991 (%)	1992 (%)
Two-sided photocopying	53	62
Revise Documents on computers	41	46
Buy in bulk	53	55
Recycle soft drink cans	59	72
Recycle cardboard boxes	54	54
Recycle newspapers	56	68
Recycle toner cartridges		
Copier /fax	11	28
Laser printer	18	32

The survey is based on 706 responses from a random sample of 135,000 customers and is considered to be accurate to ± 6.0%, 19 times out of 20. (Reference to follow).

Information Obtained about Industry Associations

Information is limited at the association level.

The **Toronto Real Estate Board** began recycling weekly listing books in September 1991. and recycled 900 tonnes in 1992. It is estimated that 60% of their paper is going back into the recycling process. Nine hundred of approximately 1,400 offices participate. (Henrickson, 1993).

Information on Individual Generators

The Canadian Imperial Bank of Commerce (CIBC), in conjunction with Inter City Papers, initiated a paper recycling program. The bank is now recycling copier and laser printer paper for reuse. 40,000 lbs. has been collected from CIBC to the end of 1991. It has expanded the program to collect a wider variety of stationery. The program won the RCO 1991 Outstanding Market Development Award (MOEE< WRO, 1993).

Olympia & York (First Canadian Place) has reduced waste sent to landfill by 83%. Paper, food waste, wooden pallets, glass, aluminum and steel containers and construction materials from renovations are recycled. At the end of 1991 the amount of waste sent to landfill was reduced from 40 to 7 tonnes per day through 3Rs programs. The office complex houses 15,000 employees and it is estimated that 30,000 people pass through the mall each day (MOEE, WRO, 1993).

Scotia Plaza has just implemented a recycling program. Diversion rates are not yet known.

Non Commercial Services Sector

This group includes all health care and educational facilities. Each will be discussed separately.

Health Care Sector

Information Obtained on Industry Associations

Information was obtained through telephone conversations and attending the Health Care Environmental Network's March 1993 meeting.

Health Care Environmental Network

The network consists of 125 members, two thirds to three quarters of which are located in the GTA. Membership is made up of:

- Hospitals;
- Nursing Homes;
- Medical offices;
- Ontario Dental Association;
- Canadian Veterinary Association;
- Consultants;
- Haulers;
- Suppliers.

All have implemented 3Rs programs internally. The network assists members by providing information on setting up programs.

Each of the 42 hospitals operating in the GTA, is a member. The network will be conducting elaborate surveys in the fall of 1993 existing waste generation and recycling systems.

Circle Consulting (a member) indicated that 40% of nursing homes and 35% of hospitals are recycling food waste. (The reliability of these figures is considered questionable by the Study Team.)

Hospitals with recycling programs have achieved 30-35% reductions in waste sent to landfill.

Ontario Hospital Association

The association indicated that all 42 hospitals in the GTA are recycling. It performed a survey in 1991 but many hospitals did not keep records of quantities diverted from landfill. A new committee has been formed to address environmental issues.

Information on Individual Generators

Sunnybrook Hospital

The hospital has developed the most elaborate 3Rs program in the hospital sector. It is currently diverting the following annual tonnages from landfill:

• Diapers	52 tonnes
• Paper	240 tonnes
• Plastic	6 tonnes
• Glass	3 tonnes
• Cans	10 tonnes
• Cardboard	126 tonnes
• **Total**	**437 tonnes**

This represents a 33% overall annual diversion rate.

In addition, the facility has proposed recycling for sanipacks (395 tonnes/yr) and food (156 tonnes/yr) (Martin, Sunnybrook Hospital, 1993)

Toronto East General

This hospital has also developed an elaborate program which has achieved the following results:

- 291.6 tonnes were diverted from landfill in 1992 - a 32% diversion rate;
- 54 tonnes (annual generation) of diapers & incontinence pads are to be added to the program this year (Tulk, 1993).

Mississauga Hospital

The hospital is recycling 43% of its total waste (WRO, 1993).

Ottawa General Hospital

Ortech produced a study of the Ottawa General Hospital in April 1992. It quoted the findings of other studies showing 95% of hospital waste is non-hazardous, non-biomedical solid waste (municipal waste). The audit found 77% of the waste disposed to be made up of food, paper and plastic. The top 5 specific wastes were:

- Food and Food Liquid (22%)
- OCC and Kraft (14%)
- Wet Paper and Gauze (8%)
- Medical Plastic (8%)
- Fine Paper and CPO (7.5%)

Ortech concluded that over 50% of the municipal waste component can be reduced, reused or recycled if the major waste types are targeted and large scale composting of food waste can be implemented.

Education Sector

Waste reduction initiatives are being undertaken at many educational facilities. Information collected to date is summarized below. This will be augmented as other information is collected and identified during this study.

University of Toronto

The university is implementing an extensive program. It encompasses operations that are part of the main university but does not include affiliated campuses. In the

1991-92 school year a 14% diversion rate was achieved. The goal for the '92-93 year is 45%, and 51% for '93-94. These increased totals will be achieved by expanding the program and increasing promotion with students (Nower, 1993).

North York Board of Education

The board implemented extensive 3Rs program. Figures are expected from the program coordinator (Niven, 1993).

Norway Public School

A program to reduce lunchroom waste has achieved 50% reductions. Numerous school boards are interested in pursuing the program (RCO, April/May, 1992).

Ryerson Polytechnical Institute

The school has implemented the collection of paper, bottles, OCC and cans for recycling (RCO).

Commercial Services Sector

The Canadian Restaurant and Food Services Association/Quick Service Restaurant Council (QSRC)

QSRC includes fast food companies such as MacDonalds, Tim Horton Donuts, Pizza Hut, etc. RIS was commissioned to prepare a national waste minimization study which was completed in May, 1992. Waste audits conducted for the study indicated that:

- total waste generated by QSRC members amounts to 147,000 tonnes, equivalent to 0.5% of waste generated in Canada annually;
- Ontario establishments account for 71,100 tonnes, or 48% of the national QSRC total;
- the largest component of the waste stream consists of food wastes which comprise 39%;
- paper fibre material represents the second largest component at 37% of total;
- plastics comprise 9% of total waste stream;
- take-out meal packaging represents 17% of total solid wastes generated, 88% of which consists of paper fibre packaging in the form of bags, boxboard containers, wraps napkins and cups. Only 12% of this waste stream consists of plastic packaging.

The survey indicated that while there are waste reduction opportunities from packaging reductions, the greatest opportunity for diversion lies in addressing the organic portion of the waste.

Recent discussions with the QSRC have indicated that no industry initiatives have been undertaken since the study was completed and that, because of the diversity of members, initiatives are more likely to be undertaken on an individual basis in the future. Two such initiatives are individual pilot composting projects initiated by Tim Horton Donuts and MacDonalds (see details below).

Additional information was gathered from other commercial services associations.

Ontario Restaurant Association

There are approximately 4,000 restaurants in the City of Toronto, and 7,000 in all of Metro. The association has about 1300 GTA members which makes up 50% of the total membership. The total includes chains, each chain counting as only one member. Therefore, the actual number of establishments represented by the association is greater than 1300 (Wrigley, 1993).

In 1991, City of Toronto (confirm Metro) began requiring all restaurants to participate in recycling programs. Materials included were glass, cans, plastics and OCC. The City's restaurants receive municipal pick-up while in the other municipalities they rely on private haulers.

The association does not collect figures on recycled materials and will not be undertaking any new initiatives as an industry. Like the QSRC, they indicated that significant diversion cannot take place until wider-scale composting is introduced.

Ontario Hotel and Motel Association

Discussions with the association indicated that no surveys or other initiatives have been undertaken with respect to waste matters (Stefanik, 1993).

Canadian Printing Industries Association

The association has 200 members and represents 10% of the industry in the GTA. Large companies such as Southam and MacLean Hunter make up the membership. The primary component of members' major solid waste stream is fine paper. The association keeps no records as to quantities. Most material is recycled, however, but this is not new diversion (Denholm, 1993).

Numerous other initiatives have been undertaken by individual generators as detailed below.

The Royal York Hotel reduced daily generated waste for disposal from a previous 12.13 tonnes to 5.44 tonnes in 1990, a 49% reduction.

The hotel diverted 66 tonnes of cardboard, 42 tonnes of newspaper, 307 tonnes of glass and 11 tonnes of cans through recycling. It encourages staff to take plastic pails that would otherwise be sent to landfill and has some suppliers collecting food pails for re-use. All food waste is sent to a company producing swill for hogs or to Second Harvest .

MacDonalds The chain has implemented a behind-the-counter program for diversion of food, paper, plastic film and cardboard. Food is sent to pig farmers, paper was going to Scott's Farms, plastic film to Reliable Recycling and cardboard to a variety of handlers. Total waste diversion is estimated to be between 50 and 60% but has not yet been confirmed (Confidential source).

Tim Horton's has introduced a behind the counter program at thirty of its stores to collect organics, glass and cardboard. The number of stores in the GTA participating in the project is not known (Confidential source).

Pizza Hut is starting the same program as Tim Horton's. Both are being administered by Phillip Environmental. Food waste from both Phillip's projects is sent to Grow Rich for composting (Confidential source).

Kelsey's Restaurants achieved a 65% reduction in waste through reduction and recycling measures (RCO, De., 1990).

Country Style Donuts reduced cardboard in boxes by 25%. The chain is also replacing corrugated cases for juice boxes with a cardboard tray with overwrap and has reduced plastics in polystyrene sandwich and salad containers by 30% (RCO).

The Ramada Renaissance Hotel at the end of 1991 was recycling 50-60% of its wastes (RCO).

The Marriot Eaton Centre Hotel is recycling over 114 tonnes of paper and 1 tonne of plastic per year in its recycling program (RCO).

Westin Hotels at its Harbour Castle facility achieved a 50% reduction in solid waste. This includes a 60% reduction in kitchen wastes. In 1992, the hotel sent 244 tonnes of food waste to farmers and recycled 65 tonnes of glass bottles, 47 tonnes of OCC and 47 tonnes of fine and mixed paper (rooms not included in program). The program encourages reduction and reuse as well as recycling (MOEE, WRO, 1993).

Public Administration Sector.

This sector includes all government offices. The previous discussion on office recycling applies to this sector as well. Most initiatives are undertaken at individual government organization levels.

Ministry of Government Services

This provincial government ministry coordinates the recycling programs for all Government of Ontario offices. It is the largest recycling program in North America and in the GTA encompasses 200-300 facilities and approximately 45,000 people. Material recycled, is comprised of:

- 75% paper;
- 3% cans and bottles;
- 10% wet wastes;
- remainder in polystyrene, wood waste, etc. (Sparling, 1993)

Liquor Control Board of Ontario The L.C.B.O. has instituted a large scale recycling program in its offices and stores. Materials included are:

- Paper;
- Newspaper;
- Cardboard;
- Bottles & Cans;
- Polystyrene;
- Other material.

Details to follow Julian Lewin (Lewin, 1993).

Brewers Retail

This government agency has also implemented a 3Rs program. Details to follow.

Governments Incorporating Procurement Policies to Eliminate Refuse (GIPPER)

This is a large scale multi-government initiative that involves offices and agencies of offices all three levels of government in Toronto. It was initiated by the Toronto Department of Public Works to coordinate government procurement policies among different offices of different levels of government and promote the 3Rs in general. The committee now includes Metro Toronto, the Toronto Transit Commission, Ontario Hydro, the Ontario Association of school business officials, provincial government departments, Supply and Services and Environment Canada.

No figures are kept by the organization as to reduction and recycling among the different members (Pagano, 1993).

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SCHEDULE O-3
Reduction and Recycling of Commercial Solid Waste in Rhode Island State

Reduction and Recycling of Commercial Solid Waste in Rhode Island State

The State of Rhode Island enacted regulations for Reduction and Recycling of Commercial and Non-Municipal Residential Solid Waste in July 1988 which were later amended in June 1991. From an IC&I perspective, the regulations stipulate that designated sectors must conduct waste audits, develop supporting waste reduction and recycling plans, and recycle the following designated materials:

- corrugated cardboard
- mixed office paper (includes office paper, computer paper, white ledger, and coloured ledger)
- newsprint
- wood waste
- aluminum
- glass food and beverage containers
- steel and tinned steel containers
- plastic soda (PET) and milk (HDPE) containers
- used lubricating oil
- vehicle batteries
- white goods
- automobiles
- telephone directories
- laser toner cartridges
- coated unbleached kraft beverage carriers
- leaves and yard waste (after January 1, 1993)

The regulations target six IC&I groups (manufacturing/industrial, hotel/restaurant, office, retail/wholesale, health care, college/university, and city/town). Any company with greater than 50 employees must comply with the regulations; however, the manner by which the timing schedule has been developed permits smaller companies to report at a later date than the larger companies. By this point, all companies with greater than 50 employees should have undertaken internal waste audits, developed Commercial Solid Waste Reduction and Recycling Plans, and submitted the first annual report.

The State of Rhode Island estimates that the regulations affect approximately 2,500 companies of a total of 25,000 companies located in the State. Of this, an estimated 80-100 companies employ greater than 500 employees, an unknown number employ between 251 to 500 employees, an estimated 400 to 500 companies employee between

101 to 250 employees, and an estimated 1,500 to 2,000 companies employ between 50 to 100 employees. The remaining 23,500 companies employ less than 50 employees.

Comments provided by one staff member at the Rhode Island Department of Environmental Management (DEM) that over 50% of the IC&I solid waste stream can be attributed to those companies with less than 50 employees, to date, has not been substantiated. A study undertaken in summer 1993 investigated waste generation and diversion activities of those companies with less than 50 employees. The anticipated date of completion for the study is mid-winter, 1994.

In 1992, Brown University Center for Environmental Studies completed a study to evaluate the effect of the mandatory commercial recycling program on the targeted companies (Brown University Center for Environmental Studies, 1992). At the time of the study, a total of 448 companies with greater than 100 employees had filed reports with the DEM. Overall, the participating companies have diverted an estimated 34% (this estimate was generated from data provided in Chapter 3 of the Brown University report. A number of assumptions were used during the development of the table) of their own waste stream through recycling programs. Note that diversion rates were reported for only eight materials (fine paper, mixed containers, aluminum cans, glass bottles, corrugated cardboard, tin/steel cans, newspaper, and wood waste).

In addition, 74% of the companies also reported to have accrued savings in avoided landfill costs while 37% reported to have generated revenue from the sales of recyclable materials.

Due to the limited availability of reported information at the time of the study, no attempt was made to evaluate the change in behaviour and attitudes towards waste generation and waste diversion as a result of companies having to undertake waste audits, develop waste reduction and recycling plans, and recycle designated materials. The report documents the percentages of companies (of 274 surveyed) reporting to have implemented a variety of source reduction activities, as follows:

- double-sided copying 53%
- reuse shipping materials 31%
- reuse of assorted materials 28%
- mugs replacing disposable cups 28%
- buying in bulk 26%
- asking suppliers to reduce packaging 9%
- reuse paper for scrap paper 9%
- E-mail, voice mail 9%
- reduce distribution of report 8%
- return shipping materials to vendors 7%

No further analysis was conducted to assess the effects of the source reduction activities on the waste stream of these companies.

Personal communications with John Callan at DEM suggest that, in fact, the program has prompted companies to look beyond the mandatory materials and develop more comprehensive waste reduction programs. John cautions that much of the additional activity has been highly dependent on available markets for the materials. As markets become saturated with materials and prices plummet, John feels that companies will stop recycling those materials.

Rhode Island appears to be the only state in the US to have legislated mandatory waste audits and source separation programs affecting the IC&I sector.

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SCHEDULE O-4
Contacts Made for Estimation of Coverage of 3Rs Regulations

Contacts Made to Refine Estimates of 3Rs Capture

As a first step in acquiring data to assess the number of establishments which would be affected by the proposed 3Rs regulations, the Study Team contacted the three IWA consultants (C.N. Watson and Associates, Keir Consulting, MM Dillon) for socio-economic information that may have been used in the IWA landfill studies and which might be relevant to this assessment. These sources focused on specific geographic areas around the proposed landfill sites, and therefore were not of value to this study.

Subsequently, the sources listed below were consulted to gather background data on the likely number of generators in each major category in the GTA who would be subject to the Ontario 3Rs regulations. The available sources did not provide data at a level of detail which would have been of value to the GTA 3Rs analysis.

List of Information Acquired for Assessment of the Impact of the 3Rs regulations:

- Estimates of affected IC&I Establishments in Ontario affected by the 3Rs regulations, MOEE, Ontario IC&I Waste Reduction Manual, 1992
- Summary of Building permits issued by year and municipality from 1981 through 1992
- Data on hospital facilities (# beds reported for non-teaching facilities but not for teaching and specialty facilities), Health Reports Supplement, #5, 1991, v3, #2, Hospital Statistics: Preliminary Annual Report, 1989/90
- Data on Schools (aggregate Ontario) - type and enrollment, Education in Canada, 1989/90
- List of post-secondary institutions in GTA (need staffing information)
- Private Schools in Ontario, Ontario Ministry of Education and Training, Apr. 1993
- List of private schools with enrollment greater than 300 students, supplied by Paul Raymond, Ontario Ministry of Education (need staffing information)
- Directory of Education, 1991/92, Ontario Ministry of Education
- Summary of office buildings - 4 size ranges; # employees averaged over each range, Metro Toronto Planning Department

- Summary of shopping centres in GTA 1983,86,90 - 5 size ranges, Metro Toronto Planning Department
- Employment Profiles - # establishments in 7 size ranges, over 6 sectors (further breakdown by sector for manufacturing sector), 1992, Metro Toronto Planning Department
- Employment Profile for Metropolitan Toronto, 1983 - 1986, Metro Toronto Planning Department
- Employment in 6 size ranges by 2-digit SIC for Metro Toronto, Statistics Canada, Business Register, 1992
- Business Establishments by 9 employment size ranges and SIC, Metro Toronto, 1991, Board of Trade for Metro Toronto, Metro Toronto Business and Market Guide, 1993
- Catalogue of Accommodations in Ontario (data on # units; need staffing information), Ontario Ministry of Culture, Tourism and Recreation, 1993

List of Contacts Made:

Background data for all regulations :

- Ontario. Ministry of the Environment. Waste Reduction Office. Contact : Adam Ciulini, 314-4633.

Retail shopping establishments :

- Municipality of Metropolitan Toronto. Planning Department Contact : Wayne Morgan, 392-8130, Ron McCallum, 392-8766.
- Region of Durham. Planning Department. Contact : Rhoda Brand-Stewart, (416) 728-7731.
- Region of Halton. Planning Department. Contact : Keith Barker, 825-7213.
- Region of Peel. Planning Department. Contact : Paul Mountford, 791-9400.
- Region of York, Planning Department. Contact : Paul Bottomley, 362-2464.

Retail shopping complexes :

- Municipality of Metropolitan Toronto. Planning Department Contact : Wayne Morgan, 392-8130, Ron McCallum, 392-8766.
- Region of Durham Planning Department. Contact : Rhoda Brand-Stewart, (416) 728-7731.
- Region of Halton. Planning Department Contact : Keith Barker, 825-7213.

- Region of Peel. Planning Department. Contact : Paul Mountford, 791-9400.
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Large construction projects :

- Municipality of Metropolitan Toronto. Planning Department. Contact : Wayne Morgan, 392-8130, Ron McCallum, 392-8766.
- Region of Durham. Planning Department. Contact : Rhoda Brand-Stewart, (416) 728-7731.
- Region of Halton. Planning Department. Contact : Keith Barker, 825-7213.
- Region of Peel. Planning Department. Contact : Paul Mountford, 791-9400.
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- Municipality of Metropolitan Toronto. Planning Department. Contact : Wayne Morgan, 392-8130, Ron McCallum, 392-8766.
- Region of Durham. Planning Department. Contact : Rhoda Brand-Stewart, (416) 728-7731.
- Region of Halton. Planning Department. Contact : Keith Barker, 825-7213.
- Region of Peel. Planning Department. Contact : Paul Mountford, 791-9400.
- Region of York, Planning Department. Contact : Paul Bottomley, 362-2464.

Office buildings :

- Municipality of Metropolitan Toronto. Planning Department. Contact : Wayne Morgan, 392-8130, Ron McCallum, 392-8766.
- Region of Durham. Planning Department. Contact : Rhoda Brand-Stewart, (416) 728-7731.
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Restaurants :

- Municipality of Metropolitan Toronto. Planning Department. Contact : Wayne Morgan, 392-8130, Ron McCallum, 392-8766.
- Region of Durham. Planning Department. Contact : Rhoda Brand-Stewart, (416) 728-7731.
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- Statistics Canada. Business Register. Unpublished data. Contact : Louise Bard, Acting External Liaison and Data Dissemination Officer, (613) 951-9021.

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- Hotel Association of Metropolitan Toronto. 629-7770.
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- Ontario. Ministry of Education. Statistical Services. Contact : Annie Lan, Statistical Information Officer, 325-2693.
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Multi-family dwellings :

- Municipality of Metropolitan Toronto. Planning Department. Contact : Wayne Morgan, 392-8130, Ron McCallum, 392-8766.
- Region of Durham. Planning Department. Contact : Rhoda Brand-Stewart, (416) 728-7731.

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- Region of York, Planning Department. Contact : Paul Bottomley, 362-2464.
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Large manufacturing establishments :

- Municipality of Metropolitan Toronto. Planning Department. Contact : Wayne Morgan, 392-8130, Ron McCallum, 392-8766.
- Region of Durham. Planning Department. Contact : Rhoda Brand-Stewart, (416) 728-7731.
- Region of Halton. Planning Department. Contact : Keith Barker, 825-7213.
- Region of Peel. Planning Department. Contact : Paul Mountford, 791-9400.
- Region of York, Planning Department. Contact : Paul Bottomley, 362-2464.
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SCHEDULE P

RESIDENTIAL NET EFFECTS TABLES

TABLE 1

GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: Residential Existing
CRITERIA GROUP: Service
CRITERIA: Reliability
INDICATOR: Proven Technologies based on Experience in Other Jurisdictions

Component Category/ Components	Component Environmental Effects	Mitigation/ Enhancement	Component Net Effects
Garbage Collection and Disposal • Curbside collection of residential garbage from single family dwellings • Collection of residential garbage from multi-family units • Self haul of garbage	• proven technology has been used for many years	• new trucks/collection methods always being tested • none required	• no effect noted
Residential Recycling and Collection • Curbside collection of Blue Box materials • Expanding curbside collection • Collection of bins of recyclables from multi-family units • Drop-off depot for multi-family residents not serviced by recycling	• technology proven, but inefficient and expensive • curbside collection, depots divert waste from landfill • converts waste to useful new material	• improve system efficiency through new designs • increased level of service (i.e. number materials collected) • add curbside service where possible (not presently available) • increase service to multi-family households • strong promotion/education program to minimize contamination	• recycling of waste products contributes to maximizing waste diversion • waste diversion increases with availability of programs

<u>Residential Leaf and Yard Waste Collection</u> • Curbside collection of leaf and yard waste • Drop-off for leaf and yard waste	• technology proven, but still needs improvements	• resolve most efficient collection method to minimize operational/compost quality problems (e.g. optimize debagging) • extension of curbside collection • increased frequency of collection in peak seasonal periods	• curbside/depot collect/diverts residential leaf yard waste form landfill • converts organic waste to useful end products (compost)
<u>Residential Household Composting</u> • Backyard composter distribution programs • Large 3-bin composting units distributed to apartment and cooperative housing complexes • Community composting	• cost efficient method of diverting household organics • proven technology, popular with some householders • reduces waste requiring management at curb • improper use may result in inactive composters or vermin	• provide free information on correct usage (strong education program) • increase use of home composters through door-to-door distribution	• generates useful end product (compost) positive educational tool • promotes responsibility for waste management at home
<u>Other Residential Waste Diversion (HHW, Toxic Taxi, White Goods Collection, White Goods Drop-off etc.)</u> • Special curbside collections of Christmas trees • Special and weekly curbside collections of white goods • Drop-off depots for white goods • Special curbside collection for bulky items • Permanent drop-off depot for household hazardous waste (HHW) • Special household hazardous waste drop-off days • Toxic Taxi service • Mobile HHW depots	• technology proven, but expensive • diverts toxic contaminants from landfill • bulky items not disposed may extend landfill life • protects useful materials for recycling	• increase participation through more promotion • increase availability of toxic taxis etc. to provide more opportunities for diversion • provide more incentives to divert HHW	• positive effects due to overall reduction of waste quantities sent to disposal and removal of hazardous contaminants from waste stream • diversion of HHW has significantly positive impact on compost quality

Schedule P-1

<u>Composting facilities</u> • Centralized windrow composting of leaf and yard waste • In-vessel composting of source separated organics	• technology proven, but has some operational problems • odour concerns can be problematic • compost quality may be poor, limiting end uses of material • technology achieves 50% mass reduction • technology achieves 80% volume reduction for leaves	• use of up to date technology and practices • source separation of organics • adequate/appropriate processing of materials prior to composting • careful process control essential to successful composting • high compost quality has many beneficial end uses	• positive due to overall volume and weight reduction of organic waste • very successful if compost can be sold
<u>Reuse Centres and Activities</u> • Municipal reuse centre • Private reuse centre • Non-profit reuse centre • Charitable reuse centres • Food reuse organization • Special goods exchange days	• proven technology experience is that this component is very popular with the public • good educational vehicle • re-use is above recycling on hierarchy	• draw more individuals in through promotion/education • provide more funding for re-use activities	• positive effects due to reuse, which is higher, than recycling on 3R's hierarchy • reduction of waste sent to landfill
<u>Public MRFs</u> • Processing centre for dry recyclables	• proven technology but constantly being redesigned for improvement • may be subject to mechanical failure • noise (due to trucks) • subject to material build-up when markets not available • processing labour intensive and low-tech	• secure end markets • careful attention to processing • constant maintenance of facility • site away from residential locations • collect and process larger quantities	• positive effects due to removal of waste from disposed stream • diverts material from disposal • processed materials for sale to secondary markets

Schedule P-1

Residential Existing System, Reliability (cont'd)

Residential Recycling Depots and Transfer Stations • Drop-off depot for dry recyclables • Depots located at transfer stations	• processing labour intensive and low-tech • proven technology, experience varies • provide practical option for recycling in small communities • small facility needed • can be engineered for easy access	• monitoring/supervision improves quality of material received • promotion education increases participation	• good method for voluntary recycling
Residential Promotion and Education • 3Rs promotion and education program • Consumer education program	• proven technology, experience is that this is an essential element of any successful recycling program • positive effect by encouraging participation and increasing waste diversion	• determine areas where additional promotion/education needed and constantly redesign programs • maintain and enhance existing programs	• positive effects by increasing householder awareness and knowledge level on waste diversion

APPENDIX P-1
TABLE 1
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: Residential Existing
CRITERIA GROUP: Service
CRITERIA: Reliability
INDICATOR: Degree of Reliance on Single Approach

Component Category/ Components	Component Environmental Effects	Mitigation/ Enhancement	Component Net Effects
Garbage Collection and Disposal • Curbside collection of residential garbage from single family dwellings • Collection of residential garbage from multi-family units • Self haul of garbage	• not dependent on single approach or facility	• maintain diversity of current approach	• no effects noted
Residential Recycling and Collection • Curbside collection of Blue Box materials • Expanding curbside collection • Collection of bins of recyclables from multi-family units • Drop-off depot for multi-family residents not serviced by recycling	• not dependent on single approach or facility • diverts dry recyclables	• maintain and enhance diversity of current approach	• positive effect due to diversion of waste from landfill • diverts dry recyclables
Residential Leaf and Yard Waste Collection • Curbside collection of leaf and yard waste • Drop-off for leaf and yard waste	• not dependent on single approach or facility • diverts organic (wet) wastes	• maintain and enhance diversity of current approach	• contributes to diversion of wet waste • positive effect due to diversion of waste from landfill

Residential Existing System, Reliability (cont'd)

Residential Household Composting • Backyard composter distribution programs • Large 3-bin composting units distributed to apartment and cooperative housing complexes • Community composting	• diversion maximized through public participation • not dependent on single type of technology (bin) • diverts wet waste	• maintain public interest through promotion education incentives • maintain diversity of types of bins available to suit residents' needs	• diverts wet household waste • positive effect due to increased participation in waste diversion • positive effect as less waste managed at the curb
Other Residential Waste Diversion (HHW, Toxic Taxi, White Goods Collection, White Goods Drop-off etc.) • Special curbside collections of Christmas trees • Special and weekly curbside collections of white goods • Drop-off depots for white goods • Special curbside collection for bulky items • Permanent drop-off depot for household hazardous waste (HHW) • Special household hazardous waste drop-off days • Toxic Taxi service • Mobile HHW depots	• uses several approaches • not dependent on single approach	• maintain diversity of current approach • promotion/education to maximize diversion	• positive effect through increase in waste diverted
Composting facilities • Centralized windrow composting of leaf and yard waste • In-vessel composting of source separated organics	• not dependent on single approach or technology • can only process organic wastes	• maintain diversity of current approach	• positive effect through potential for large quantities of wet waste to be diverted

<u>Reuse Centres and Activities</u> • Municipal reuse centre • Private reuse centre • Non-profit reuse centre • Charitable reuse centres • Food reuse organization • Special goods exchange days	• not dependent on single approach	• increase and support diversity of reuse activities	• positive effect through increased quantities of waste diverted • positive effect through public involvement
<u>Public MRFs</u> • Processing centre for dry recyclables	• not dependent on single approach or facility due to availability of several local MRF's • processes dry materials only	• maintain and improve operating status of existing facilities • build more MRFs or expand as required	• positive effect through quantities of dry waste diverted
<u>Residential Recycling Depots and Transfer Stations</u> • Drop-off depot for dry recyclables • Depots located at transfer stations	• not dependent on single approach or facility due to availability of several depots	• maintain and expand current facilities in convenient locations	• positive effect through increasing quantities of waste diversion • positive effect through public involvement and participation
<u>Residential Promotion and Education</u> • 3Rs promotion and education program • Consumer education program	• not dependent on single approach	• maintain and improve current level of service	• positive effects through encouragement of participation in waste diversion

APPENDIX P-1
TABLE 1
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: Residential Existing
CRITERIA GROUP: Service
CRITERIA: Flexibility
INDICATOR: Types and Range of Quantities of Waste Accepted

Component Category/ Components	Component Environmental Effects	Mitigation/ Enhancement	Component Net Effects
Garbage Collection and Disposal • Curbside collection of residential garbage from single family dwellings • Collection of residential garbage from multi-family units • Self haul of garbage	• can accept all types of residential garbage (wet and dry) • quantities accepted not limited • waste diversion enhanced through landfill bans and garbage collection restrictions • significantly decreased quantities collected may cause revenue shortfalls, impacting on diversion programs	• maintain/improve existing bans and restrictions to encourage waste diversion • achieve appropriate balance between revenue and costs • implement waste diversion measures • decrease level of service to encourage waste diversion by homeowner • impose bag limit to increase waste diversion	• increasing positive effect through public compliance with bans and participation in waste diversion

Residential Recycling and Collection • Curbside collection of Blue Box materials • Expanding curbside collection • Collection of bins of recyclables from multi-family units • Drop-off depot for multi-family residents not serviced by recycling	• accepts household quantities of dry recyclables for which markets are available • positive effect due to increased diversion from landfill; negative effect if recyclables decrease • decreased materials results in failure to support growing markets and possible closure of MRFs • increased quantities diverted may require increased collection and processing • positive effect through waste diversion	• maintain/expand existing number of materials collected • promotion/education • develop markets for new materials • maintain/improve level of recycling, in conjunction with supporting technology for collection and processing • encourage increased participation through promotion/ education • diversion enhanced in expanded blue box programs (Quinte) • market development to expand number of materials which can be managed	• positive effect through increase in number and volume of dry materials collected and diverted
Residential Leaf and Yard Waste Collection • Curbside collection of leaf and yard waste • Drop-off for leaf and yard waste	• manages leaf and yard wastes generated by residential sources • quantities managed not limited • waste diversion maximized by removing seasonal organic materials from waste stream • additional quantities can be accepted for diversion • increased quantities will require new composting facilities • less may result in closure of existing facilities with materials sent to landfill	• increase availability of residential collection service • implement supporting landfill and curbside bans (Oakville) • focus promotion/education campaigns • encourage full utilization of household backyard composters and techniques such as "grasscycling" • promote source separation of leaf and yard waste for compost • extend seasonal collection periods and special collections (ie. Christmas)	• positive effect through increased amount of wet materials collected and diverted

Residential Household Composting • Backyard composter distribution programs • Large 3-bin composting units distributed to apartment and cooperative housing complexes • Community composting	• does not handle any dry household wastes • accepts food and yard waste generated by households • diversion increased with residential use of backyard compostors • quantities of materials accepted limited by size of bin • limited ability to adapt to changing characteristics or quantities: – range of materials accepted limited by type of bin – range and quantity effected by participation and proper usage • positive impact through waste diversion (100-240 kg/hh/yr)	• encourage residents to place all appropriate material in composters • facilitate distribution of composters (incentives, location etc.) • distribution of larger bins and increase number of bins allocated/household • promotion/education program	• positive effect with anticipated increase as promotion/education effects take hold
Other Residential Waste Diversion (HHW, Toxic Taxi, White Goods Collection, White Goods Drop-off etc.) • Special curbside collections of Christmas trees • Special and weekly curbside collections of white goods • Drop-off depots for white goods • Special curbside collection for bulky items • Permanent drop-off depot for household hazardous waste (HHW) • Special household hazardous waste drop-off days • Toxic Taxi service • Mobile HHW depots	• small quantities of HHW can be managed • limited quantities of other materials handled • diversion increased through availability of recycling opportunities for different types of waste • reduces toxicity in landfill sites • collection is flexible to accommodate increased volume of materials • increasingly positive impact through waste diversion	• expand existing facilities • increase range of materials accepted • develop new markets to support existing programs • promotion/education to ensure public support • source reduction	• positive effect due to diversion of contaminated and bulky wastes from landfill • positive effect because system can accommodate increased or decreased amount or quantity of material

Composting facilities • Centralized windrow composting of leaf and yard waste • In-vessel composting of source separated organics	• handle organic materials (food and yard) generated by households • quantities handled depend on design capacity of facility (no limitations) • does not handle dry materials generated by households • diversion increased through acceptance of source separated wastes for compost • range of materials limited to clean leaf and yard waste for highest quality product • limited capacity at existing GTA facilities; increased capacity may require new facilities • positive impact through waste diversion of wet wastes (40% of household wastes)	• improve technology and efficiency of existing facilities to permit more efficient processing and increased annual capacity • expand existing or build new facilities as required • carefully control quality of incoming feedstream, so finished compost will have unrestricted use	• positive effect due to increased quantity of wet material diverted • end product (compost) a valuable resource, if quality high
Reuse Centres and Activities • Municipal reuse centre • Private reuse centre • Non-profit reuse centre • Charitable reuse centres • Food reuse organization • Special goods exchange days	• accepts range of materials • quantities generally low • increased diversion through availability of reuse opportunities • provides opportunity to divert materials for which recycling is not technically feasible • well suited to adapt to changing waste characteristics and quantities leading to increased waste diversion • increasing positive effect through waste diversion	• expand network of reuse opportunities • identify uses for wider range of materials • provide residential collection where possible • increased market capacity • increased promotion and education	• positive effect through increased tonnage and quantity of materials diverted from waste • reuse more desirable than recycling, it is a higher use of a waste material

Residential Existing System, Flexibility (cont'd)

Public MRFs • Processing centre for dry recyclables	• quantities accepted depend on MRF capacity (no limitations) • types of waste received are limited to dry recyclables for which markets are available • ensures feasibility of recycling by processing and marketing materials • enhances waste diversion from landfill • existing MRFs have limited capacity • increase in quantity or type of material collected will require expansion of existing facilities • changes in characteristics will require processing adaptations • positive effect of residential stream can be diverted	• increase size and number of facilities as required • increase accepted range of source separated materials where possible • increase efficiency of existing MRFs • increase efficiency in processing facilities through improved front end residential source separation • improve MRF sorting techniques to reduce mistaken disposal of residuals • modify MRF designs to handle larger quantities and more types of dry recyclables	• processes source separated residential dry recyclables in order to market secondary materials • positive effect through potential for increased diversion from waste stream

<u>Residential Recycling Depots and Transfer Stations</u> • Drop-off depot for dry recyclables • Depots located at transfer stations	• types of materials accepted depend on depot, generally dry residential recyclables for which markets available • quantities accepted vary with depot design, size of site, etc. • domes can increase source separation and increase efficiency of MRF • changing characteristics or quantities results in larger depot sites required • diversion can be limited by poor source separation	• increase number of compartmentalized domes available to residents • increase number of depot facilities with expanded range of materials • design changes in depot sites (eg engineered sites) • more frequent collection from existing sites • greater number of containers per site • increase diversion through residential source separation and incentive programs • improve source separation with monitoring and promotion/ education • improve convenience of depots to residents • provide residents with household containers (Blue Boxes)	• positive effect through expanded range and increased quantity of materials accepted • increased capacity for waste diversion
<u>Residential Promotion and Education</u> • 3Rs promotion and education program • Consumer education program	• very important method of trying to minimize contamination of materials set out for recycling • supports existing programs • educates public re: new materials accepted (changes) • no effects identified	• maintain and improve public education programs • incorporate multi-lingual promotion/education as required	• positive effect through increased participation in 3Rs programs

APPENDIX P-1
TABLE 1
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: Residential Existing
CRITERIA GROUP: Service
CRITERIA: Flexibility
INDICATOR: Compatibility with Existing System

Component Category/ Components	Component Environmental Effects	Mitigation/ Enhancement	Component Net Effects
Garbage Collection and Disposal • Curbside collection of residential garbage from single family dwellings • Collection of residential garbage from multi-family units • Self haul of garbage	• not applicable	• not applicable	• not applicable
Residential Recycling and Collection • Curbside collection of Blue Box materials • Expanding curbside collection • Collection of bins of recyclables from multi-family units • Drop-off depot for multi-family residents not serviced by recycling	• not applicable	• not applicable	• not applicable
Residential Leaf and Yard Waste Collection • Curbside collection of leaf and yard waste • Drop-off for leaf and yard waste	• not applicable	• not applicable	• not applicable

Residential Household Composting • Backyard composter distribution programs • Large 3-bin composting units distributed to apartment and cooperative housing complexes • Community composting	• not applicable	• not applicable	• not applicable
Other Residential Waste Diversion (HHW, Toxic Taxi, White Goods Collection, White Goods Drop-off etc.) • Special curbside collections of Christmas trees • Special and weekly curbside collections of white goods • Drop-off depots for white goods • Special curbside collection for bulky items • Permanent drop-off depot for household hazardous waste (HHW) • Special household hazardous waste drop-off days • Toxic Taxi service • Mobile HHW depots	• not applicable	• not applicable	• not applicable
Composting facilities • Centralized windrow composting of leaf and yard waste • In-vessel composting of source separated organics	• not applicable	• not applicable	• not applicable

Residential Existing System, Flexibility (cont'd)

Reuse Centres and Activities • Municipal reuse centre • Private reuse centre • Non-profit reuse centre • Charitable reuse centres • Food reuse organization • Special goods exchange days	• not applicable	• not applicable	• not applicable
Public MRFs • Processing centre for dry recyclables	• not applicable	• not applicable	• not applicable
Residential Recycling Depots and Transfer Stations • Drop-off depot for dry recyclables • Depots located at transfer stations	• not applicable	• not applicable	• not applicable
Residential Promotion and Education • 3Rs promotion and education program • Consumer education program	• not applicable	• not applicable	• not applicable

APPENDIX P-1
TABLE 1
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: Residential Existing
CRITERIA GROUP: Service
CRITERIA: Performance
INDICATOR: Quantity Diverted or Requiring Landfilling

Component Category/ Components	Component Environmental Effects	Mitigation/ Enhancement	Component Net Effects
Garbage Collection and Disposal • Curbside collection of residential garbage from single family dwellings • Collection of residential garbage from multi-family units • Self haul of garbage	• garbage collection handles materials not diverted • existing attempts to reduce material sent to landfill result in positive effect • residual recyclables landfilled result in negative effect	• maintain and enhance existing 3R's diversion programs, to decrease quantity of garbage collected • expand markets, improve processing to reduce quantities of residuals sent to landfill	• necessary component of system
Residential Recycling and Collection • Curbside collection of Blue Box materials • Expanding curbside collection • Collection of bins of recyclables from multi-family units • Drop-off depot for multi-family residents not serviced by recycling	• existing blue box and expanded blue box programs result in positive effect through reduced waste disposal • can divert 11%-17% of residential waste stream	• increase and expand existing residential recycling and collection program	• positive effect due to waste diverted

Residential Leaf and Yard Waste Collection • Curbside collection of leaf and yard waste • Drop-off for leaf and yard waste	• 2.4 to 10.9% of residential waste stream diverted through residential leaf and yard waste collection programs	• expand existing residential leaf and yard waste collection programs • increase public participation through promotion/education • increase frequency of collection in peak seasonal periods	• positive effect due to potential for increased waste diversion
Residential Household Composting • Backyard composter distribution programs • Large 3-bin composting units distributed to apartment and cooperative housing complexes • Community composting	• average 100 to 240 kg/hh/yr diverted through residential household composting • positive effect due to decreased garbage handling and disposal requirements	• maintain and increase availability of residential household composting programs • provide bins to all small apartment/co-operative housing units • expand community composting network • provide incentives for use of backyard composting units	• potential for increased waste diversion and reduced waste disposal at a very economical level, as waste does not reach the curb

Other Residential Waste Diversion (HHW, Toxic Taxi, White Goods Collection, White Goods Drop-off etc.) • Special curbside collections of Christmas trees • Special and weekly curbside collections of white goods • Drop-off depots for white goods • Special curbside collection for bulky items • Permanent drop-off depot for household hazardous waste (HHW) • Special household hazardous waste drop-off days • Toxic Taxi service • Mobile HHW depots	• positive effect through reduction of quantity and toxic contamination levels of materials disposed	• increase accessibility of diversion opportunities • provide incentives for participation • encourage participation through promotion/education programs	• potential for increased waste diversion and reduced waste disposal
Composting facilities • Centralized windrow composting of leaf and yard waste • In-vessel composting of source separated organics	• positive effect through significant reduction (weight and volume) of materials sent to landfill through processing at composting facilities • quantity diverted varies depending on program.	• increase efficiency of existing facilities • improve source separation of materials to reduce residuals sent to landfill	• potential for increased waste diversion and reduced waste disposal
Reuse Centres and Activities • Municipal reuse centre • Private reuse centre • Non-profit reuse centre • Charitable reuse centres • Food reuse organization • Special goods exchange days	• positive effect of waste diversion not yet maximized	• increase public awareness and encourage participation through promotion/education	• potential for increased waste diversion and reduced waste disposal

Schedule P-1

Residential Existing System, Performance (cont'd)

Public MRFs • Processing centre for dry recyclables	• positive effect through processing 12%-23% of residential waste stream	• improve source separation • improve collection and processing technology to reduce contamination/breakage and produce superior quality end product	• potential for increased waste diversion and reduced waste disposal
Residential Recycling Depots and Transfer Stations • Drop-off depot for dry recyclables • Depots located at transfer stations	• diverts 1%-6% of residential waste stream • positive effect through provision of opportunity to recycle blue box/expanded blue box materials • material contamination can reduce positive effects	• monitor depots to reduce contamination and thus materials disposed	• potential for increased waste diversion and reduced waste disposal
Residential Promotion and Education • 3Rs promotion and education program • Consumer education program	• diversion specific to promotion not easily quantified • can support improvement of recycling/diversion techniques, resulting in positive environmental effect • 3R's personnel agree that it has a positive effect	• maintain and expand existing promotion/education campaigns as required	• potential for increased waste diversion and reduced waste disposal

APPENDIX P-2
TABLE 1
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: Residential Existing/Committed
CRITERIA GROUP: Service
CRITERIA: Reliability
INDICATOR: Proven Technologies based on Experience in Other Jurisdictions

Component Category/ Components	Component Environmental Effects	Mitigation/ Enhancement	Component Net Effects
Garbage Collection and Disposal • Curbside collection of residential garbage from single family dwellings • Collection of residential garbage from multi-family units • Self haul of garbage • Regional recycling legislation	• proven technology has been used for many years	• expand legislation as diversion opportunities are identified for other materials • support with promotion/ education programs on diversion techniques • new trucks, collection methods always being tested	• positive due to increase in waste diversion
Residential Recycling and Collection • Curbside collection of Blue Box materials • Expanding curbside collection • Collection of bins of recyclables from multi-family units • Drop-off depot for multi-family residents not serviced by recycling • Community reducing centres • Recycling at all multi-family buildings of 6 or more units • Blue Box recycling mandated • Engineered recycling depot	• technology proven but inefficient and expensive • positive effect through participation in community recycling centres (Durham) • mandatory blue box recycling supports existing system with positive effect • engineered recycling depot improves quality (and quantity) of methods recycled in depot programs	• improve system efficiency through new designs • support initiatives with promotion/education programs to encourage participation • expand services to all municipalities • increased level of service (i.e. number of materials collected • strong promotion/education program to minimize contamination	• positive due to anticipated increase in waste diversion

Residential Existing/Committed System, Reliability (cont'd)

Residential Leaf and Yard Waste Collection • Curbside collection of leaf and yard waste • Drop-off for leaf and yard waste	• no additional effect noted	• none required	• no additional effect noted
Residential Household Composting • Backyard composter distribution programs • Large 3-bin composting units distributed to apartment and cooperative housing complexes • Community composting	• no additional effect noted	• none required	• no additional effect noted
Other Residential Waste Diversion (HHW, Toxic Taxi, White Goods Collection, White Goods Drop-off etc.) • Special curbside collections of Christmas trees • Special and weekly curbside collections of white goods • Drop-off depots for white goods • Special curbside collection for bulky items • Permanent drop-off depot for household hazardous waste (HHW) • Special household hazardous waste drop-off days • Toxic Taxi service • Mobile HHW depots	• no additional effect noted	• none required	• no additional effect noted

Composting facilities • Centralized windrow composting of leaf and yard waste • In-vessel composting of source separated organics	• no additional effect noted	• none required	• no additional effect noted
Reuse Centres and Activities • Municipal reuse centre • Private reuse centre • Non-profit reuse centre • Charitable reuse centres • Food reuse organization • Special goods exchange days	• no additional effect noted	• none required	• no additional effect noted
Public MRFs • Processing centre for dry recyclables	• no additional effect noted	• none required	• no additional effect noted
Residential Recycling Depots and Transfer Stations • Drop-off depot for dry recyclables • Depots located at transfer stations	• no additional effect noted	• none required	• no additional effect noted
Residential Promotion and Education • 3Rs promotion and education program • Consumer education program	• no additional effect noted	• none required	• no additional effect noted

APPENDIX P-2
TABLE 1
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: Residential Existing/Committed
CRITERIA GROUP: Service
CRITERIA: Reliability
INDICATOR: Degree of Reliance on Single Approach

Component Category/ Components	Component Environmental Effects	Mitigation/ Enhancement	Component Net Effects
Garbage Collection and Disposal • Curbside collection of residential garbage from single family dwellings • Collection of residential garbage from multi-family units • Self haul of garbage • Regional recycling legislation	• not reliant on a single approach; legislation may be in form of any type of policy initiative (bans, incentives, taxes etc.)	• experiment with various legislative/regulatory approaches to identify most suitable approach for each constituency	• positive effect by matching approach to existing regulatory framework in each community
Residential Recycling and Collection • Curbside collection of Blue Box materials • Expanding curbside collection • Collection of bins of recyclables from multi-family units • Drop-off depot for multi-family residents not serviced by recycling • Community reducing centres • Recycling at all multi-family buildings of 6 or more units • Blue Box recycling mandated • Engineered recycling depot	• technological improvements (engineered depot, recycling centres and multi-family recycling) amenable to various approaches • blue box recycling mandate is fixed	• identify best approach to meet needs and budget • maintain blue box recycling and expand as required and/or feasible	• positive effect of increasing waste diversion with improved approaches and maintenance of existing level of service available

<u>Residential Leaf and Yard Waste Collection</u> • Curbside collection of leaf and yard waste • Drop-off for leaf and yard waste	• no additional effect noted	• none required	• no additional effect noted
<u>Residential Household Composting</u> • Backyard composter distribution programs • Large 3-bin composting units distributed to apartment and cooperative housing complexes • Community composting	• no additional effect noted	• none required	• no additional effect noted
<u>Other Residential Waste Diversion (HHW, Toxic Taxi, White Goods Collection, White Goods Drop-off etc.)</u> • Special curbside collections of Christmas trees • Special and weekly curbside collections of white goods • Drop-off depots for white goods • Special curbside collection for bulky items • Permanent drop-off depot for household hazardous waste (HHW) • Special household hazardous waste drop-off days • Toxic Taxi service • Mobile HHW depots	• no additional effect noted	• none required	• no additional effect noted

Residential Existing/Committed System, Reliability (cont'd)

Composting facilities • Centralized windrow composting of leaf and yard waste • In-vessel composting of source separated organics	• no additional effect noted	• none required	• no additional effect noted
Reuse Centres and Activities • Municipal reuse centre • Private reuse centre • Non-profit reuse centre • Charitable reuse centres • Food reuse organization • Special goods exchange days	• no additional effect noted	• none required	• no additional effect noted
Public MRFs • Processing centre for dry recyclables	• no additional effect noted	• none required	• no additional effect noted
Residential Recycling Depots and Transfer Stations • Drop-off depot for dry recyclables • Depots located at transfer stations	• no additional effect noted	• none required	• no additional effect noted
Residential Promotion and Education • 3Rs promotion and education program • Consumer education program	• no additional effect noted	• none required	• no additional effect noted

APPENDIX P-2
TABLE 1
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: Residential Existing/Committed
CRITERIA GROUP: Service
CRITERIA: Flexibility
INDICATOR: Types and Range of Quantities of Waste Accepted

Component Category/ Components	Component Environmental Effects	Mitigation/ Enhancement	Component Net Effects
Garbage Collection and Disposal • Curbside collection of residential garbage from single family dwellings • Collection of residential garbage from multi-family units • Self haul of garbage • Regional recycling legislation	• positive effect on waste reduction by limiting the types and quantities of waste accepted • may result in required expansion or increase of MRFs to accept material collected	• expand recycling legislation to further limited types and quantities as feasible	• positive effect through reduction of types and quantities of waste accepted
Residential Recycling and Collection • Curbside collection of Blue Box materials • Expanding curbside collection • Collection of bins of recyclables from multi-family units • Drop-off depot for multi-family residents not serviced by recycling • Community reducing centres • Recycling at all multi-family buildings of 6 or more units • Blue Box recycling mandated • Engineered recycling depot	• positive effect by increasing opportunities for waste diversion available to residents • may result in required expansion or increase in number of existing MRFs to accept material collected	• increase efficiency of existing MRFs • direct promotion/education campaign at proper source separation techniques to support efficient processing	• positive effect through increased collection/diversion of waste from landfill

Residential Leaf and Yard Waste Collection • Curbside collection of leaf and yard waste • Drop-off for leaf and yard waste	• potential diversion of 11%-16% of generated waste stream	• none required	• no additional effect noted
Residential Household Composting • Backyard composter distribution programs • Large 3-bin composting units distributed to apartment and cooperative housing complexes • Community composting	• no additional effect noted	• none required	• no additional effect noted
Other Residential Waste Diversion (HHW, Toxic Taxi, White Goods Collection, White Goods Drop-off etc.) • Special curbside collections of Christmas trees • Special and weekly curbside collections of white goods • Drop-off depots for white goods • Special curbside collection for bulky items • Permanent drop-off depot for household hazardous waste (HHW) • Special household hazardous waste drop-off days • Toxic Taxi service • Mobile HHW depots	• no additional effect noted	• none required	• no additional effect noted

Composting facilities • Centralized windrow composting of leaf and yard waste • In-vessel composting of source separated organics	• no additional effect noted	• none required	• no additional effect noted
Reuse Centres and Activities • Municipal reuse centre • Private reuse centre • Non-profit reuse centre • Charitable reuse centres • Food reuse organization • Special goods exchange days	• no additional effect noted	• none required	• no additional effect noted
Public MRFs • Processing centre for dry recyclables	• no additional effect noted	• none required	• no additional effect noted
Residential Recycling Depots and Transfer Stations • Drop-off depot for dry recyclables • Depots located at transfer stations	• no additional effect noted	• none required	• no additional effect noted
Residential Promotion and Education • 3Rs promotion and education program • Consumer education program	• no additional effect noted	• none required	• no additional effect noted

APPENDIX P-2
TABLE 1
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: Residential Existing/Committed
CRITERIA GROUP: Service
CRITERIA: Flexibility
INDICATOR: Compatibility with Existing System

Component Category/ Components	Component Environmental Effects	Mitigation/ Enhancement	Component Net Effects
Garbage Collection and Disposal • Curbside collection of residential garbage from single family dwellings • Collection of residential garbage from multi-family units • Self haul of garbage • Regional recycling legislation	• likely to reduce waste collected • may result in slight changes to existing system by reducing volume/weight collected per household per trip	• revise collection schedules as required	• limited impact on existing system resulting in positive effect through waste reduction
Residential Recycling and Collection • Curbside collection of Blue Box materials • Expanding curbside collection • Collection of bins of recyclables from multi-family units • Drop-off depot for multi-family residents not serviced by recycling • Community reducing centres • Recycling at all multi-family buildings of 6 or more units • Blue Box recycling mandated • Engineered recycling depot	• may require increased MRF capacity, efficiency and processing rates • may require increased collection frequency or shortened routes for collection	• revise collection schedules as required • update processing facilities to respond to demand	• places higher demand an existing system • results in overall positive environmental effect through increased waste diversion

Residential Leaf and Yard Waste Collection • Curbside collection of leaf and yard waste • Drop-off for leaf and yard waste	• no additional effect noted	• none required	• no additional effect noted
Residential Household Composting • Backyard composter distribution programs • Large 3-bin composting units distributed to apartment and cooperative housing complexes • Community composting	• no additional effect noted	• none required	• no additional effect noted
Other Residential Waste Diversion (HHW, Toxic Taxi, White Goods Collection, White Goods Drop-off etc.) • Special curbside collections of Christmas trees • Special and weekly curbside collections of white goods • Drop-off depots for white goods • Special curbside collection for bulky items • Permanent drop-off depot for household hazardous waste (HHW) • Special household hazardous waste drop-off days • Toxic Taxi service • Mobile HHW depots	• no additional effect noted	• none required	• no additional effect noted

Residential Existing/Committed System, Flexibility (cont'd)

Composting facilities • Centralized windrow composting of leaf and yard waste • In-vessel composting of source separated organics	• no additional effect noted	• none required	• no additional effect noted
Reuse Centres and Activities • Municipal reuse centre • Private reuse centre • Non-profit reuse centre • Charitable reuse centres • Food reuse organization • Special goods exchange days	• no additional effect noted	• none required	• no additional effect noted
Public MRFs • Processing centre for dry recyclables	• no additional effect noted	• none required	• no additional effect noted
Residential Recycling Depots and Transfer Stations • Drop-off depot for dry recyclables • Depots located at transfer stations	• no additional effect noted	• none required	• no additional effect noted
Residential Promotion and Education • 3Rs promotion and education program • Consumer education program	• no additional effect noted	• none required	• no additional effect noted

TABLE 1

GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: Residential Existing/Committed
CRITERIA GROUP: Service
CRITERIA: Performance
INDICATOR: Quantity Diverted or Requiring Landfilling

Component Category/ Components	Component Environmental Effects	Mitigation/ Enhancement	Component Net Effects
Garbage Collection and Disposal • Curbside collection of residential garbage from single family dwellings • Collection of residential garbage from multi-family units • Self haul of garbage • Regional recycling legislation	• net positive effect through reduced requirement for disposal and landfill life extension	• none required	• as notes
Residential Recycling and Collection • Curbside collection of Blue Box materials • Expanding curbside collection • Collection of bins of recyclables from multi-family units • Drop-off depot for multi-family residents not serviced by recycling • Community reducing centres • Recycling at all multi-family buildings of 6 or more units • Blue Box recycling mandated • Engineered recycling depot	• net positive effect through diversion of additional materials from landfill • potential requirement for additional MRFs • could result in diversion of 20%-40% of residential waste stream	• increase efficiency of existing MRFs to reduce requirement for new MRF siting construction	• net positive effect

Residential Leaf and Yard Waste Collection • Curbside collection of leaf and yard waste • Drop-off for leaf and yard waste	• could result in diversion of 11%-16% of residential waste stream	• none required	• no additional effect noted
Residential Household Composting • Backyard composter distribution programs • Large 3-bin composting units distributed to apartment and cooperative housing complexes • Community composting	• average 100-240 kg/hh/yr diverted through residential household composting	• none required	• no additional effect noted
Other Residential Waste Diversion (HHW, Toxic Taxi, White Goods Collection, White Goods Drop-off etc.) • Special curbside collections of Christmas trees • Special and weekly curbside collections of white goods • Drop-off depots for white goods • Special curbside collection for bulky items • Permanent drop-off depot for household hazardous waste (HHW) • Special household hazardous waste drop-off days • Toxic Taxi service • Mobile HHW depots	• no additional effect noted	• none required	• no additional effect noted

Composting facilities • Centralized windrow composting of leaf and yard waste • In-vessel composting of source separated organics	• contributes to processing of 11%-16% of residential waste stream	• none required	• no additional effect noted
Reuse Centres and Activities • Municipal reuse centre • Private reuse centre • Non-profit reuse centre • Charitable reuse centres • Food reuse organization • Special goods exchange days	• could result in diversion of 1%-2% of residential waste stream	• none required	• no additional effect noted
Public MRFs • Processing centre for dry recyclables	• contributes to processing of 20%-40% of residential waste stream	• none required	• no additional effect noted
Residential Recycling Depots and Transfer Stations • Drop-off depot for dry recyclables • Depots located at transfer stations	• could result in diversion of 1% - 6% of residential waste stream	• none required	• no additional effect noted
Residential Promotion and Education • 3Rs promotion and education program • Consumer education program	• no additional effect noted	• none required	• no additional effect noted

TABLE 1

GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: Direct Cost
CRITERIA GROUP: Service
CRITERIA: Reliability
INDICATOR: Proven Technologies Based on Experience in Other Jurisdictions

Component Category/ Components	Component Environmental Effects	Mitigation/ Enhancement	Component Net Effects
Garbage Collection and Disposal • Curbside collection of residential garbage from single family dwellings • Collection of residential garbage from multi-family units • Self haul of garbage • Regional recycling legislation • Direct cost for garbage disposal	• direct cost for garbage disposal has been proven to decrease the quantity of garbage collection by up to 40% • may result in initial incidences of illegal dumping	• monitor dumping of waste; source depot sites etc. • encourage community approach to waste diversion through promotion/education	• positive effect demonstrated through reductions in waste disposed
Residential Recycling and Collection • Curbside collection of Blue Box materials • Expanding curbside collection • Collection of bins of recyclables from multi-family units • Drop-off depot for multi-family residents not serviced by recycling • Community reducing centres • Recycling at all multi-family buildings of 6 or more units • Blue Box recycling mandated • Engineered recycling depot	• direct cost has demonstrated potential to increase residential recycling of dry materials significantly • estimates for GTA lower, because recycling systems are fully developed	• none required • promotion/education to ensure dry materials not contaminated	• higher quantities of dry materials collected

Direct Cost System, Reliability (cont'd)

Residential Leaf and Yard Waste Collection • Curbside collection of leaf and yard waste • Drop-off for leaf and yard waste	• proven technology • quantities of material handled likely to increase	• none required	• quantities likely to increase
Residential Household Composting • Backyard composter distribution programs • Large 3 bin composting units distributed to apartment and cooperative housing complexes • Community composting	• proven technology • direct cost likely to cause increase in usage (experienced in other jurisdictions)	• full promotion/education to support direct cost element of program	• positive effect through increasing waste diversion
Other Residential Waste Diversion (HHW, Toxic Taxi, White Goods Collection, White Goods Drop-off etc.) • Special curbside collections of Christmas trees • Special and weekly curbside collections of white goods • Drop-off depots for white goods • Special curbside collection for bulky items • Permanent drop-off depot for household hazardous waste (HHW) • Special household hazardous waste drop-off days • Toxic Taxi service • Mobile HHW depots	• proven technology • experience elsewhere indicates that usage of these components likely to increase with implementation of direct cost	• promotion/education to ensure materials uncontaminated	• increased usage

<u>Composting facilities</u> • Centralized windrow composting of leaf and yard waste • In-vessel composting of source separated organics	• composting facilities receive greater amounts of material	• increase efficiency or expand as required	• increased usage likely positive effect through increased waste diversion
<u>Reuse Centres and Activities</u> • Municipal reuse centre • Private reuse centre • Non-profit reuse centre • Charitable reuse centres • Food reuse organization • Special goods exchange days	• usage likely to increase	• promotion/education	• increased usage
<u>Public MRFs</u> • Processing centre for dry recyclables	• increased demand placed on MRF capacity	• increase efficiency or expand as required • support development of markets for increased types/quantities of material	• positive effect through processing increased quantities
<u>Residential Recycling Depots and Transfer Stations</u> • Drop-off depot for dry recyclables • Depots located at transfer stations	• increased usage likely • positive effect through increased quantities of recyclables collected	• amend collection schedules or expand as required	• positive effect through increased collection of materials
<u>Residential Promotion and Education</u> • 3Rs promotion and education program • Consumer education program	• experience in other jurisdictions indicates that extensive promotion/education essential elements of successful direct cost	• promotion/education program explaining direct cost and options for waste diversion	• increased promotion/education required

Schedule P-3

APPENDIX P-3
TABLE 1
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: Direct Cost
CRITERIA GROUP: Service
CRITERIA: Reliability
INDICATOR: Degree of Reliance on Single Approach

Component Category/ Components	Component Environmental Effects	Mitigation/ Enhancement	Component Net Effects
Garbage Collection and Disposal • Curbside collection of residential garbage from single family dwellings • Collection of residential garbage from multi-family units • Self haul of garbage • Regional recycling legislation • Direct cost for garbage disposal	• same as existing disposal	• same as existing disposal	• same as existing disposal
Residential Recycling and Collection • Curbside collection of Blue Box materials • Expanding curbside collection • Collection of bins of recyclables from multi-family units • Drop-off depot for multi-family residents not serviced by recycling • Community reducing centres • Recycling at all multi-family buildings of 6 or more units • Blue Box recycling mandated • Engineered recycling depot	• reliance on single approach for recycling would reduce effect of direct cost for waste and increase illegal dumping	• ensure maximum range of options for recycling and collection	• maximize waste diversion resulting in positive effect

Residential Leaf and Yard Waste Collection • Curbside collection of leaf and yard waste • Drop-off for leaf and yard waste	• no effects identified	• none required	• no effects identified
Residential Household Composting • Backyard composter distribution programs • Large 3-bin composting units distributed to apartment and cooperative housing complexes • Community composting	• achieving high waste diversion rates dependent on parallel implementation of backyard composting by large number of single family households	• promotion/education of backyard composting free bin distribution • availability of other forms of composting alternatives	• 45% waste diversion possible (Durham)
Other Residential Waste Diversion (HHW, Toxic Taxi, White Goods Collection, White Goods Drop-off etc.) • Special curbside collections of Christmas trees • Special and weekly curbside collections of white goods • Drop-off depots for white goods • Special curbside collection for bulky items • Permanent drop-off depot for household hazardous waste (HHW) • Special household hazardous waste drop-off days • Toxic Taxi service • Mobile HHW depots	• no specific effects identified	• none identified	• no specific effects identified

Composting facilities • Centralized windrow composting of leaf and yard waste • In-vessel composting of source separated organics	• no specific effects identified	• none identified	• no specific effects identified
Reuse Centres and Activities • Municipal reuse centre • Private reuse centre • Non-profit reuse centre • Charitable reuse centres • Food reuse organization • Special goods exchange days	• no specific effects identified	• none identified	• no specific effects identified
Public MRFs • Processing centre for dry recyclables	• no specific effects identified	• none identified	• no specific effects identified
Residential Recycling Depots and Transfer Stations • Drop-off depot for dry recyclables • Depots located at transfer stations	• no specific effects identified	• none identified	• no specific effects identified
Residential Promotion and Education • 3Rs promotion and education program • Consumer education program	• no specific effects identified	• none identified	• no specific effects identified

APPENDIX P-3
TABLE 1
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: Direct Cost
CRITERIA GROUP: Service
CRITERIA: Flexibility
INDICATOR: Types and Range of Quantities of Wastes Accepted

Component Category/ Components	Component Environmental Effects	Mitigation/ Enhancement	Component Net Effects
Garbage Collection and Disposal • Curbside collection of residential garbage from single family dwellings • Collection of residential garbage from multi-family units • Self haul of garbage • Regional recycling legislation • Direct cost for garbage disposal	• no effect identified on types of garbage accepted • quantities affected by residential waste collection will decrease	• quantities of waste collected should be reduced	• positive effect through reduction of residential waste disposed
Residential Recycling and Collection • Curbside collection of Blue Box materials • Expanding curbside collection • Collection of bins of recyclables from multi-family units • Drop-off depot for multi-family residents not serviced by recycling • Community reducing centres • Recycling at all multi-family buildings of 6 or more units • Blue Box recycling mandated • Engineered recycling depot	• increased quantity of dry recyclables collected • reduced waste collected is likely to reflect increase in quantity of recyclables • may require weekly recyclables collection	• promotion/education for source reduction • organize recycling collection for maximum efficiency	• positive effect through increase in waste reduction through recycling

Residential Leaf and Yard Waste Collection • Curbside collection of leaf and yard waste • Drop-off for leaf and yard waste	• may increase amounts of waste separated for collection	• prepare to revise collection schedules if required	• increase quantity of leaf and yard waste collected
Residential Household Composting • Backyard composter distribution programs • Large 3-bin composting units distributed to apartment and cooperative housing complexes • Community composting	• quantity of household wet waste managed by backyard composters likely to increase	• identify technological developments that may improve/enhance backyard composting efficiency • promotion/education to ensure proper use of existing units	• positive effect through expanded household compost program resulting in increased quantities of waste diverted
Other Residential Waste Diversion (HHW, Toxic Taxi, White Goods Collection, White Goods Drop-off etc.) • Special curbside collections of Christmas trees • Special and weekly curbside collections of white goods • Drop-off depots for white goods • Special curbside collection for bulky items • Permanent drop-off depot for household hazardous waste (HHW) • Special household hazardous waste drop-off days • Toxic Taxi service • Mobile HHW depots	• potential positive effect through increased materials collected	• expand facilities, collection and markets as required	• positive effect due to increased material diverted

Composting facilities • Centralized windrow composting of leaf and yard waste • In-vessel composting of source separated organics	• assume positive effect through increased material for processing	• update and expand or increase existing facilities to accommodate increased amount of material	• positive effect through increased waste diversion
Reuse Centres and Activities • Municipal reuse centre • Private reuse centre • Non-profit reuse centre • Charitable reuse centres • Food reuse organization • Special goods exchange days	• no specific effects identified	• none required	• no specific effects identified
Public MRFs • Processing centre for dry recyclables	• greater quantities of materials to be processed will result in higher demand on existing facilities • potential for higher contamination due to poor source separation or "dumping"	• increase efficiency of existing facilities to accommodate increased quantities of materials • encourage effective source separation by residents to contribute to efficiency • monitor source separation at depots and through curbside collection programs	• positive effect through effective processing of materials
Residential Recycling Depots and Transfer Stations • Drop-off depot for dry recyclables • Depots located at transfer stations	• no specific effects identified	• none required	• no specific effects identified

Residential Promotion and Education • 3Rs promotion and education program • Consumer education program	• no specific effects identified	• none required	• no specific effects identified

APPENDIX P-3
TABLE 1
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: Direct Cost
CRITERIA GROUP: Service
CRITERIA: Flexibility
INDICATOR: Compatibility with Existing System

Component Category/ Components	Component Environmental Effects	Mitigation/ Enhancement	Component Net Effects
Garbage Collection and Disposal • Curbside collection of residential garbage from single family dwellings • Collection of residential garbage from multi-family units • Self haul of garbage • Regional recycling legislation • Direct cost for garbage disposal	• no effects noted	• none required	• no effects noted
Residential Recycling and Collection • Curbside collection of Blue Box materials • Expanding curbside collection • Collection of bins of recyclables from multi-family units • Drop-off depot for multi-family residents not serviced by recycling • Community reducing centres • Recycling at all multi-family buildings of 6 or more units • Blue Box recycling mandated • Engineered recycling depot	• no effects noted	• none required	• no effects noted

Residential Leaf and Yard Waste Collection • Curbside collection of leaf and yard waste • Drop-off for leaf and yard waste	• no effects noted	• none required	• no effects noted
Residential Household Composting • Backyard composter distribution programs • Large 3-bin composting units distributed to apartment and cooperative housing complexes • Community composting	• requires heavier participation by residents in household composting	• promotion/education	• positive effect of high participation resulting in increased waste diversion
Other Residential Waste Diversion (HHW, Toxic Taxi, White Goods Collection, White Goods Drop-off etc.) • Special curbside collections of Christmas trees • Special and weekly curbside collections of white goods • Drop-off depots for white goods • Special curbside collection for bulky items • Permanent drop-off depot for household hazardous waste (HHW) • Special household hazardous waste drop-off days • Toxic Taxi service • Mobile HHW depots	• no specific effects identified	• none required	• no specific effects identified

Composting facilities • Centralized windrow composting of leaf and yard waste • In-vessel composting of source separated organics	• may required new or expansion of existing facilities	• monitor and adapt as required	• positive effect through ability to accommodate increased quantities of material
Reuse Centres and Activities • Municipal reuse centre • Private reuse centre • Non-profit reuse centre • Charitable reuse centres • Food reuse organization • Special goods exchange days	• no specific effects identified	• none required	• no specific effects identified
Public MRFs • Processing centre for dry recyclables	• place higher demand on existing facilities	• expand or adapt as required	• no positive effect through processing increased quantities of material
Residential Recycling Depots and Transfer Stations • Drop-off depot for dry recyclables • Depots located at transfer stations	• no specific effects identified	• none required	• no specific effects identified
Residential Promotion and Education • 3Rs promotion and education program • Consumer education program	• no specific effects identified	• none required	• no specific effects identified

APPENDIX P-3
TABLE 1
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: Direct Cost
CRITERIA GROUP: Service
CRITERIA: Performance
INDICATOR: Quantity Diverted or Requiring Landfilling

Component Category/ Components	Component Environmental Effects	Mitigation/ Enhancement	Component Net Effects
Garbage Collection and Disposal • Curbside collection of residential garbage from single family dwellings • Collection of residential garbage from multi-family units • Self haul of garbage • Regional recycling legislation • Direct cost for garbage disposal	• positive effect through reduced quantity requiring disposal in landfill	• none required	• positive effect of reduction in waste disposed
Residential Recycling and Collection • Curbside collection of Blue Box materials • Expanding curbside collection • Collection of bins of recyclables from multi-family units • Drop-off depot for multi-family residents not serviced by recycling • Community reducing centres • Recycling at all multi-family buildings of 6 or more units • Blue Box recycling mandated • Engineered recycling depot	• positive effect through increase in amount of recyclables collected for waste diversion	• may require increased frequency of collection	• positive effect

Residential Leaf and Yard Waste Collection • Curbside collection of leaf and yard waste • Drop-off for leaf and yard waste	• potential positive effect through increase in amount of material separated for collection • possible diversion of 11%-16% of residential waste stream	• none required	• positive effect
Residential Household Composting • Backyard composter distribution programs • Large 3-bin composting units distributed to apartment and cooperative housing complexes • Community composting	• positive effect through achievement of high participation in household composting by single family households • significant additional achievements likely to be difficult to achieve (100-240 kg/hh/yr)	• none required	• increased diversion
Other Residential Waste Diversion (HHW, Toxic Taxi, White Goods Collection, White Goods Drop-off etc.) • Special curbside collections of Christmas trees • Special and weekly curbside collections of white goods • Drop-off depots for white goods • Special curbside collection for bulky items • Permanent drop-off depot for household hazardous waste (HHW) • Special household hazardous waste drop-off days • Toxic Taxi service • Mobile HHW depots	• likely increase in use of facilities	• none required	• increased usage

<u>Composting facilities</u> • Centralized windrow composting of leaf and yard waste • In vessel composting of source separated organics	• contributes to processing for 11% - 16% of residential waste stream	• none required	• no specific effects identified
<u>Reuse Centres and Activities</u> • Municipal reuse centre • Private reuse centre • Non-profit reuse centre • Charitable reuse centres • Food reuse organization • Special goods exchange days	• additional possible diversion of 2% of residential waste stream	• none required	• no specific effects identified
<u>Public MRFs</u> • Processing centre for dry recyclables	• possible increase in residuals due to material contamination • anticipated higher output of recyclables to market • contributes to processing of 20% - 40% of residential waste stream	• expand markets as required • ensure good separation of materials at plant and by residents	• positive effect through increased processing of source separated recyclables • positive effect through increased waste diversion
<u>Residential Recycling Depots and Transfer Stations</u> • Drop-off depot for dry recyclables • Depots located at transfer stations	• possible diversion of 1% to 6% of residential waste stream	• none required	• no specific effects identified
<u>Residential Promotion and Education</u> • 3Rs promotion and education program • Consumer education program	• no specific effects identified	• none required	• no specific effects identified

TABLE 1

GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: Expanded Blue Box
CRITERIA GROUP: Service
CRITERIA: Reliability
INDICATOR: Proven Technologies Based on Experience in Other Jurisdictions

Component Category/ Components	Component Environmental Effects	Mitigation/ Enhancement	Component Net Effects
Garbage Collection and Disposal • Curbside collection of residential garbage from single family dwellings • Collection of residential garbage from multi-family units • Self haul of garbage • Regional recycling legislation	• positive effect through reduction in waste disposed due to increased opportunities for recycling	• none required	• decreased quantity for disposal
Residential Recycling and Collection • Curbside collection of Blue Box materials • Expanding curbside collection • Collection of bins of recyclables from multi-family units • Drop-off depot for multi-family residents not serviced by recycling • Community reducing centres • Recycling at all multi-family buildings of 6 or more units • Blue Box recycling mandated • Engineered recycling depot	• positive effect demonstrated at Quinte, Edmonton, Burnaby, Bluewater, and Seattle	• strong promotion/education program	• positive effect of increased recyclables collection

Expanded Blue Box System, Reliability (cont'd)

Residential Leaf and Yard Waste Collection • Curbside collection of leaf and yard waste • Drop-off for leaf and yard waste	• no effects identified	• none required	• no effects identified
Residential Household Composting • Backyard composter distribution programs • Large 3-bin composting units distributed to apartment and cooperative housing complexes • Community composting	• positive effect of increased waste diversion with backyard composting by high number of households	• increase with promotion/ education, door-to-door bin distribution etc • provide new types of bins and bins to apartment and co operative housing	• positive effect through increased waste diversion
Other Residential Waste Diversion (HHW, Toxic Taxi, White Goods Collection, White Goods Drop-off etc.) • Special curbside collections of Christmas trees • Special and weekly curbside collections of white goods • Drop-off depots for white goods • Special curbside collection for bulky items • Permanent drop-off depot for household hazardous waste (HHW) • Special household hazardous waste drop off days • Toxic Taxi service • Mobile HHW depots	• positive effect through increased waste diversion	• promotion/education campaign	• no effects identified

Composting facilities • Centralized windrow composting of leaf and yard waste • In-vessel composting of source separated organics	• no specific effects identified	• none required	• no specific effects identified
Reuse Centres and Activities • Municipal reuse centre • Private reuse centre • Non-profit reuse centre • Charitable reuse centres • Food reuse organization • Special goods exchange days	• no effects identified	• none required	• no effects identified
Public MRFs • Processing centre for dry recyclables	• heavier demand placed on existing capacity and staff	• expand or improve efficiency as required • add staff if necessary	• positive effect through increased capacity for processing recyclables
Residential Recycling Depots and Transfer Stations • Drop-off depot for dry recyclables • Depots located at transfer stations	• no effects identified	• non required	• no effects identified
Residential Promotion and Education • 3Rs promotion and education program • Consumer education program	• positive effects generated through significant promotion/education for residents	• focus on promotion/education with on-going diversified campaign	• positive effect through increased participation in all aspects of waste diversion

APPENDIX P-4
TABLE 1
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: Expanded Blue Box
CRITERIA GROUP: System
CRITERIA: Reliability
INDICATOR: Degree of Reliance on Single Approach

Component Category/ Components	Component Environmental Effects	Mitigation/ Enhancement	Component Net Effects
Garbage Collection and Disposal • Curbside collection of residential garbage from single family dwellings • Collection of residential garbage from multi family units • Self haul of garbage • Regional recycling legislation	• no effects identified	• none required	• no effects identified
Residential Recycling and Collection • Curbside collection of Blue Box materials • Expanding curbside collection • Collection of bins of recyclables from multi-family units • Drop-off depot for multi-family residents not serviced by recycling • Community reducing centres • Recycling at all multi family buildings of 6 or more units • Blue Box recycling mandated • Engineered recycling depot	• does not rely on single approach • positive effect through combination of expanded curbside and depot recycling and backyard composting	• maintain diversity of approach	• positive effect through increased waste diversion

Residential Leaf and Yard Waste Collection • Curbside collection of leaf and yard waste • Drop-off for leaf and yard waste	• no effects identified	• none required	• no effects identified
Residential Household Composting • Backyard composter distribution programs • Large 3-bin composting units distributed to apartment and cooperative housing complexes • Community composting	• positive effect through reliance on use of varying technologies/approaches to suit residents' needs	• ensure adequate flexibility in terms of bin types, residents' expectations, costs etc.	• positive effect of increasing participation and diversion by responding to individual needs/interests of residents
Other Residential Waste Diversion (HHW, Toxic Taxi, White Goods Collection, White Goods Drop-off etc.) • Special curbside collections of Christmas trees • Special and weekly curbside collections of white goods • Drop-off depots for white goods • Special curbside collection for bulky items • Permanent drop-off depot for household hazardous waste (HHW) • Special household hazardous waste drop-off days • Toxic Taxi service • Mobile HHW depots	• no effects identified	• none required	• no effects identified

Expanded Blue Box System, Reliability (cont'd)

Composting facilities • Centralized windrow composting of leaf and yard waste • In-vessel composting of source separated organics	• no effects identified	• none required	• no effects identified
Reuse Centres and Activities • Municipal reuse centre • Private reuse centre • Non-profit reuse centre • Charitable reuse centres • Food reuse organization • Special goods exchange days	• no effects identified	• none required	• no effects identified
Public MRFs • Processing centre for dry recyclables	• collection of wide range of materials ensures different processing arrangements • positive effect, not dependent on single approach or facility • may increase separation at trucks or contribute to other local MRFs as required	• maintain flexibility of approach • design collection system to best meet MRF needs • design depots for source separation • none required	• positive effect of flexibility contributing to increased ability for material processing • no effects identified
Residential Recycling Depots and Transfer Stations • Drop off depot for dry recyclables • Depots located at transfer stations	• no effects identified	• none required	• no effects identified

Residential Promotion and Education • 3Rs promotion and education program • Consumer education program	• positive effects, not limited by single approach	• utilize diverse approaches for promotion/education campaigns	• no specific effects identified

APPENDIX P-4
TABLE 1
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: Expanded Blue Box
CRITERIA GROUP: Service
CRITERIA: Flexibility
INDICATOR: Compatibility with Existing System

Component Category/ Components	Component Environmental Effects	Mitigation/ Enhancement	Component Net Effects
Garbage Collection and Disposal • Curbside collection of residential garbage from single family dwellings • Collection of residential garbage from multi-family units • Self haul of garbage • Regional recycling legislation	• no effects identified, compatible with existing system	• none required	• no effects identified
Residential Recycling and Collection • Curbside collection of Blue Box materials • Expanding curbside collection • Collection of bins of recyclables from multi-family units • Drop-off depot for multi-family residents not serviced by recycling • Community reducing centres • Recycling at all multi-family buildings of 6 or more units • Blue Box recycling mandated • Engineered recycling depot	• may require adaptation of existing collection vehicles or schedules	• amend as required	• positive effect of increased recyclables collection

Residential Leaf and Yard Waste Collection • Curbside collection of leaf and yard waste • Drop-off for leaf and yard waste	• compatible with existing system	• none required	
Residential Household Composting • Backyard composter distribution programs • Large 3-bin composting units distributed to apartment and cooperative housing complexes • Community composting	• compatible with existing system	• promote backyard composting door-to-door to increase participation	• increase diversion of household organics
Other Residential Waste Diversion (HHW, Toxic Taxi, White Goods Collection, White Goods Drop-off etc.) • Special curbside collections of Christmas trees • Special and weekly curbside collections of white goods • Drop-off depots for white goods • Special curbside collection for bulky items • Permanent drop-off depot for household hazardous waste (HHW) • Special household hazardous waste drop-off days • Toxic Taxi service • Mobile HHW depots	• compatible with existing system	• none required	• none required

Expanded Blue Box System, Flexibility (cont'd)

Composting Facilities • Centralized windrow composting of leaf and yard waste • In-vessel composting of source separated organics	• compatible with existing system	• none required	• no effects identified
Reuse Centres and Activities • Municipal reuse centre • Private reuse centre • Non-profit reuse centre • Charitable reuse centres • Food reuse organization • Special goods exchange days	• no effects identified, compatible with existing system	• none required	• no effects identified
Public MRFs • Processing centre for dry recyclables	• compatible with existing system • may require additional processing for new materials	• identify processing requirements • expand existing MRF if necessary	• increased processing capacity
Residential Recycling Depots and Transfer Stations • Drop-off depot for dry recyclables • Depots located at transfer stations	• compatible with existing system	• adapt as required to accept wider range of dry materials	• increased diversion
Residential Promotion and Education • 3Rs promotion and education program • Consumer education program	• existing promotion/education program does not address new materials	• new promotion/education program needed to address wider range of materials included in recycling program	• new promotion/education program • increased diversion

APPENDIX P-4
TABLE 1
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: Expanded Blue Box
CRITERIA GROUP: Service
CRITERIA: Flexibility
INDICATOR: Types and Range of Quantities of Waste Accepted

Component Category/ Components	Component Environmental Effects	Mitigation/ Enhancement	Component Net Effects
Garbage Collection and Disposal • Curbside collection of residential garbage from single family dwellings • Collection of residential garbage from multi-family units • Self haul of garbage • Regional recycling legislation	• positive effect on waste reduction by limiting the types and quantities of waste accepted • may result in required expansion or increase of MRFs to accept material collected	• expand recycling legislation to further limited types and quantities as feasible	• positive effect through reduction of types and quantities of waste accepted
Residential Recycling and Collection • Curbside collection of Blue Box materials • Expanding curbside collection • Collection of bins of recyclables from multi-family units • Drop-off depot for multi-family residents not serviced by recycling • Community reducing centres • Recycling at all multi-family buildings of 6 or more units • Blue Box recycling mandated • Engineered recycling depot	• positive effect by increasing opportunities for waste diversion available to residents by acceptance of wider range of materials • likely to result in required expansion or increase in number of existing MRFs to accept material collected	• increase efficiency of existing MRFs to accept/process more materials • direct promotion/education campaign at proper source separation techniques to support efficient processing	• positive effect through increased collection/diversion of waste from landfill

Residential Leaf and Yard Waste Collection • Curbside collection of leaf and yard waste • Drop-off for leaf and yard waste	• potential diversion of 11%-16% of generated waste stream	• none required	• no additional effect noted
Residential Household Composting • Backyard composter distribution programs • Large 3-bin composting units distributed to apartment and cooperative housing complexes • Community composting	• no additional effect noted	• none required	• no additional effect noted
Other Residential Waste Diversion (HHW, Toxic Taxi, White Goods Collection, White Goods Drop-off etc.) • Special curbside collections of Christmas trees • Special and weekly curbside collections of white goods • Drop-off depots for white goods • Special curbside collection for bulky items • Permanent drop-off depot for household hazardous waste (HHW) • Special household hazardous waste drop off days • Toxic Taxi service • Mobile HHW depots	• no additional effect noted	• none required	• no additional effect noted

<u>Composting facilities</u> • Centralized windrow composting of leaf and yard waste • In-vessel composting of source separated organics	• no additional effect noted	• none required	• no additional effect noted
<u>Reuse Centres and Activities</u> • Municipal reuse centre • Private reuse centre • Non-profit reuse centre • Charitable reuse centres • Food reuse organization • Special goods exchange days	• no additional effect noted	• none required	• no additional effect noted
<u>Public MRFs</u> • Processing centre for dry recyclables	• increased quantities of materials processed	• likely to require expansion or system review to accommodate wider range of materials	• increased quantities and range of materials processed
<u>Residential Recycling Depots and Transfer Stations</u> • Drop-off depot for dry recyclables • Depots located at transfer stations	• potential increased range and quantities of materials accepted in expanded program	• may require revised set-up of depots including signage and bins	• increased quantities of materials expected to be diverted through depots
<u>Residential Promotion and Education</u> • 3Rs promotion and education program • Consumer education program	• extensive promotion and education needed explain new range of materials collected	• review and expand promotion and education programs	• result in increased quantities and higher quality of recyclables in expanded program

APPENDIX P-4

TABLE 1

GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: Expanded Blue Box
CRITERIA GROUP: Service
CRITERIA: Performance
INDICATOR: Quantity Diverted or Requiring Landfilling

Component Category/ Components	Component Environmental Effects	Mitigation/ Enhancement	Component Net Effects
Garbage Collection and Disposal • Curbside collection of residential garbage from single family dwellings • Collection of residential garbage from multi-family units • Self haul of garbage • Regional recycling legislation	• positive effect of decreased waste disposed due to increase opportunities for recycling	• none required	• positive effects • decreased quantity of garbage for disposal
Residential Recycling and Collection • Curbside collection of Blue Box materials • Expanding curbside collection • Collection of bins of recyclables from multi-family units • Drop-off depot for multi-family residents not serviced by recycling • Community reducing centres • Recycling at all multi-family buildings of 6 or more units • Blue Box recycling mandated • Engineered recycling depot	• positive effect of increased recycling due to expansion of materials collected • quantity diverted increases • quantity landfilled decreases • potential to divert 20%-40% of residential waste stream	• maintain and enhance expanded program • support with market development • ensure good separation of materials to prevent landfilling of residuals	• positive effects of increased waste diversion

Residential Leaf and Yard Waste Collection • Curbside collection of leaf and yard waste • Drop-off for leaf and yard waste	• potential to divert 11%-16% of residential waste stream	• none required	• no effects identified
Residential Household Composting • Backyard composter distribution programs • Large 3-bin composting units distributed to apartment and cooperative housing complexes • Community composting	• positive effect of increased participation in backyard composting • average 100 to 240 kg/hh/yr diverted through residential backyard composting	• maintain and support high participation rates with distribution of bins (and second bins etc.) technical assistance etc.	• positive effect of increased participation resulting in higher waste diversion rates
Other Residential Waste Diversion (HHW, Toxic Taxi, White Goods Collection, White Goods Drop-off etc.) • Special curbside collections of Christmas trees • Special and weekly curbside collections of white goods • Drop-off depots for white goods • Special curbside collection for bulky items • Permanent drop-off depot for household hazardous waste (HHW) • Special household hazardous waste drop-off days • Toxic Taxi service • Mobile HHW depots	• no effects identified	• none required	• no effects identified

Composting facilities • Centralized windrow composting of leaf and yard waste • In-vessel composting of source separated organics	• contributes to processing of 11%-16% of residential waste stream	• none required	• no additional effects identified
Reuse Centres and Activities • Municipal reuse centre • Private reuse centre • Non profit reuse centre • Charitable reuse centres • Food reuse organization • Special goods exchange days	• potential to divert 1%-2% of residential waste stream	• none required	• no additional effects identified
Public MRFs • Processing centre for dry recyclables	• quantities diverted increase • positive effect of increase and output of recyclable materials • contributes to processing of 20% to 40% of residential waste stream	• improve efficiency and facility design to accommodate increased types and quantities of materials • identify new markets for expanded range of materials	• positive effect of increased diversion of dry recyclables
Residential Recycling Depots and Transfer Stations • Drop off depot for dry recyclables • Depots located at transfer stations	• quantities received may increase • potential to divert 1% to 6% of residential waste stream	• identify and accommodate new requirements • may require additional capacity, retrofits, expansion or revised collection schedules	• increased diversion
Residential Promotion and Education • 3Rs promotion and education program • Consumer education program	• quantities diverted because of this component not easily quantified	• new promotion/education program will increase diversion	• no increased diversion

TABLE 1
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: Wet/Dry
CRITERIA GROUP: Service
CRITERIA: Reliability
INDICATOR: Proven Technologies Based on Experience in Other Jurisdictions

Component Category/ Components	Component Environmental Effects	Mitigation/ Enhancement	Component Net Effects
Garbage Collection and Disposal • Curbside collection of residential garbage from single family dwellings in three-stream system • Collection of residential garbage from multi-family units • Self haul of garbage • Regional recycling legislation	• proven technology in European cities • has had mixed success in Ontario at pilot scale • proposed City of Guelph system will provide data on 2-stream • complete replacement of existing system • new collection system required to accommodate 3-stream separation of waste • specially designed trucks required • provide carts as required for waste collection	• promotion/education program designed to describe wet/dry system to householder	• source separation of wastes into three stream leading to disposal reduction

Residential Recycling and Collection • Collection of bins of recyclables from multi-family units • Drop-off depot for multi-family residents not serviced by recycling • Community reducing centres • Recycling at all multi-family buildings of 6 of more units	• demonstrated achievements of significant diversion of dry recyclables • carts, blue boxes or special bags used for material source separation by residents (Halton, Mississauga) • recyclables collected along with garbage in 3-stream system	• increase collection of recyclables through promotion/education	• increased waste diversion
Residential Leaf and Yard Waste Collection • Curbside collection of leaf and yard waste • Drop-off for leaf and yard waste	• proven technology • no effects identified, maintain regular collection of leaf and yard waste	• none required	• no effects identified
Residential Household Composting • Backyard composter distribution programs • Large 3-bin composting units distributed to apartment and cooperative housing complexes • Community composting	• proven technology, effective in diverting household organics	• maintain and increase participation in backyard composting	• improve waste diversion with increased backyard composting

Other Residential Waste Diversion (HHW, Toxic Taxi, White Goods Collection, White Goods Drop-off etc.) • Special curbside collections of Christmas trees • Special and weekly curbside collections of white goods • Drop-off depots for white goods • Special curbside collection for bulky items • Permanent drop-off depot for household hazardous waste (HHW) • Special household hazardous waste drop-off days • Toxic Taxi service • Mobile HHW depots	• no effects identified	• none required	• no effects identified
Composting facilities • Centralized windrow composting of leaf and yard waste • In-vessel composting of source separated organics	• increased household organic material will require additional centralized composting facilities for processing • new processing techniques may be required to accommodate large quantities of household organic fraction of waste (wet stream) • compost can be sold/used if quality high	• facilities have experienced compost quality problems and odour problems • expand existing facilities or adapt existing to fit system requirements • strong promotion/education to minimize contamination • careful process control to minimize odours	• significant diversion of wet stream household waste • some operational difficulties not fully resolved

Wet/Dry System, Reliability (cont'd)

Reuse Centres and Activities • Municipal reuse centre • Private reuse centre • Non-profit reuse centre • Charitable reuse centres • Food reuse organization • Special goods exchange days	• no effects identified	• none required	• no effects identified
Public MRFs • Processing centre for dry recyclables	• proven technology • new or expanded MRF required to process larger stream with wider range of materials	• strong promotion/education to ensure minimum contamination of dry stream	• increased
Residential Recycling Depots and Transfer Stations • Drop-off depot for dry recyclables • Depots located at transfer stations	• no effects identified	• non required	• higher diversion with new promotion/education system
Residential Promotion and Education • 3Rs promotion and education program • Consumer education program	• significant promotion/education critical to establishment of new 3-stream system • positive effect demonstrated in increased diversion	• new promotion/education program	• higher diversion with new promotion/education system

TABLE 1
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: Wet/Dry
CRITERIA GROUP: Service
CRITERIA: Reliability
INDICATOR: Degree of Reliance on Single Approach

Component Category/ Components	Component Environmental Effects	Mitigation/ Enhancement	Component Net Effects
Garbage Collection and Disposal • Curbside collection of residential garbage from single family dwellings in three-stream system • Collection of residential garbage from multi-family units • Self haul of garbage • Regional recycling legislation	• relies on single approach (wet-dry) • if unsuccessful, can modify to garbage collection system	• strong promotion/education to ensure correct separation and success of system	• increased source separation and diversion
Residential Recycling and Collection • Collection of bins of recyclables from multi-family units • Drop-off depot for multi-family residents not serviced by recycling • Community reducing centres • Recycling at all multi-family buildings of 6 of more units	• depots, backyard composters, etc. form part of recycling system, lessen reliance on single approach	• maintain alternative approaches to curbside collection of waste	• positive effects through protection of diversified system for waste reduction

Residential Leaf and Yard Waste Collection • Curbside collection of leaf and yard waste • Drop-off for leaf and yard waste	• no effects noted	• none required	• no effects noted
Residential Household Composting • Backyard composter distribution programs • Large 3-bin composting units distributed to apartment and cooperative housing complexes • Community composting	• positive effects of maintaining safe-guard against system failure through backyard composting	• continue to distribute bins door-to-door implement promotion/education etc	• positive effects of safe-guard for waste diversion
Other Residential Waste Diversion (HHW, Toxic Taxi, White Goods Collection, White Goods Drop-off etc.) • Special curbside collections of Christmas trees • Special and weekly curbside collections of white goods • Drop-off depots for white goods • Special curbside collection for bulky items • Permanent drop-off depot for household hazardous waste (HHW) • Special household hazardous waste drop-off days • Toxic Taxi service • Mobile HHW depots	• no effects noted	• none required	• no effects noted

Composting facilities • Centralized windrow composting of leaf and yard waste • In-vessel composting of source separated organics	• dependent on centralized composting facility for success of system • construction of additional composting facilities provides alternative processing in the event of failure	• construct additional compost facilities as required or develop arrangements with neighbouring regions in case of problems • if compost quality unacceptable use as landfill cover	• if successful, significant diversion achieved
Reuse Centres and Activities • Municipal reuse centre • Private reuse centre • Non-profit reuse centre • Charitable reuse centres • Food reuse organization • Special goods exchange days	• no effects noted	• none required	• no effects noted
Public MRFs • Processing centre for dry recyclables	• dependent on MRF for processing of dry recyclables • dependent on successful markets	• arrange for use of other facilities, in the event of MRF failure	• if successful, diversion achieved, and revenue generated
Residential Recycling Depots and Transfer Stations • Drop-off depot for dry recyclables • Depots located at transfer stations	• maintain depots as safe-guard to curbside collection failure for recyclables • positive effects in maintaining waste diversion	• maintain or expand facilities as required	• provide safe-guard to waste diversion system
Residential Promotion and Education • 3Rs promotion and education program • Consumer education program	• not dependent on single approach	• maintain diversity of approaches	• encourage participation in waste diversion through effective promotion education

APPENDIX P-5
TABLE 1
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: User Pay
CRITERIA GROUP: Service
CRITERIA: Reliability
INDICATOR: Types and Range of Quantities of Wastes Accepted

Component Category/ Components	Component Environmental Effects	Mitigation/ Enhancement	Component Net Effects
Garbage Collection and Disposal • Curbside collection of residential garbage from single family dwellings in three-stream system • Collection of residential garbage from multi family units • Self haul of garbage • Regional recycling legislation	• handles full range and quantity of residential waste generated	• none required	• no effects identified
Residential Recycling and Collection • Collection of bins of recyclables from multi-family units • Drop-off depot for multi-family residents not serviced by recycling • Community reducing centres • Recycling at all multi-family buildings of 6 of more units	• positive effect of waste diversion through increased source separation for recycling	• strong promotion/education	• increased diversion

<u>Residential Leaf and Yard Waste Collection</u> • Curbside collection of leaf and yard waste • Drop-off for leaf and yard waste	• handles leaf and yard wastes only • no effects identified	• none required	• no effects identified
<u>Residential Household Composting</u> • Backyard composter distribution programs • Large 3-bin composting units distributed to apartment and cooperative housing complexes • Community composting	• handles household food and yard wastes • positive effect through on-going diversion of residential organics in backyard composters • minimized diversion costs with low-tech method • quantities handled limited by size of composter	• encourage maintenance of backyard composting with distribution of free bins, promotion/education etc.	• positive effect by supplementing centralized compost system for waste diversion
<u>Other Residential Waste Diversion (HHW, Toxic Taxi, White Goods Collection, White Goods Drop-off etc.)</u> • Special curbside collections of Christmas trees • Special and weekly curbside collections of white goods • Drop-off depots for white goods • Special curbside collection for bulky items • Permanent drop-off depot for household hazardous waste (HHW) • Special household hazardous waste drop-off days • Toxic Taxi service • Mobile HHW depots	• no effects noted	• none required	• no effects noted

Composting facilities • Centralized windrow composting of leaf and yard waste • In-vessel composting of source separated organics	• handles full range of food and yard wastes generated by residential sources • quantities handled limited by design capacity of systems • poor separation would have negative effect on processing	• retrofit, upgrade, expand and increase efficiency of existing systems to accommodate new demands • construct new large centralized composting plant to handle large quantities of source separated organics	• significant diversion of household organics
Reuse Centres and Activities • Municipal reuse centre • Private reuse centre • Non profit reuse centre • Charitable reuse centres • Food reuse organization • Special goods exchange days	• no effects noted	• none required	• no effects noted
Public MRFs • Processing centre for dry recyclables	• MRF designed to handle full quantity and range of dry recyclables collected in three-stream system	• expansion/replacement of existing MRF's	• increased diversion of dry recyclables
Residential Recycling Depots and Transfer Stations • Drop-off depot for dry recyclables • Depots located at transfer stations	• no effects noted	• none required	• no effects noted
Residential Promotion and Education • 3Rs promotion and education program • Consumer education program	• required strong promotion/education campaign for the new system	• implement promotion/education programs as required	• support new program • positive effect in increased waste diversion

TABLE 1

GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: Wet/Dry
CRITERIA GROUP: Service
CRITERIA: Flexibility
INDICATOR: Compatibility with Existing System

Component Category/ Components	Component Environmental Effects	Mitigation/ Enhancement	Component Net Effects
Garbage Collection and Disposal • Curbside collection of residential garbage from single family dwellings in three-stream system • Collection of residential garbage from multi-family units • Self haul of garbage • Regional recycling legislation	• not compatible with existing system • replacement of existing waste collection system required • require new trucks and collection equipment • householders need new carts	• promotion/education • provide bins etc. as required • staff training	• smooth transition to new system for waste diversion
Residential Recycling and Collection • Collection of bins of recyclables from multi-family units • Drop-off depot for multi-family residents not serviced by recycling • Community reducing centres • Recycling at all multi-family buildings of 6 of more units	• not compatible with existing system • carried out with garbage collection in 3-stream system	• replace existing system	• positive effect in contribution to waste diversion

Residential Leaf and Yard Waste Collection • Curbside collection of leaf and yard waste • Drop-off for leaf and yard waste	• maintain seasonal collection of leaf and yard wastes • compatible with existing system	• none required	• positive effect in contribution to waste diversion
Residential Household Composting • Backyard composter distribution programs • Large 3-bin composting units distributed to apartment and cooperative housing complexes • Community composting	• continue promotion of backyard composting	• none required	• no effects identified
Other Residential Waste Diversion (HHW, Toxic Taxi, White Goods Collection, White Goods Drop-off etc.) • Special curbside collections of Christmas trees • Special and weekly curbside collections of white goods • Drop-off depots for white goods • Special curbside collection for bulky items • Permanent drop-off depot for household hazardous waste (HHW) • Special household hazardous waste drop-off days • Toxic Taxi service • Mobile HHW depots	• no effects identified	• none required	• no effects identified

Composting facilities • Centralized windrow composting of leaf and yard waste • In-vessel composting of source separated organics	• compatible with existing system, but requires additional, new centralized composting facilities • positive effects through all utilization of existing facilities • upgrade/alter equipment as required to accommodate new feedstocks	• expand or enhance efficiency of existing facilities • expand/identify markets for new type/quality end product	• positive effects of increasing waste diversion through processing of organics
Reuse Centres and Activities • Municipal reuse centre • Private reuse centre • Non-profit reuse centre • Charitable reuse centres • Food reuse organization • Special goods exchange days	• no effects identified	• none required	• no effects identified
Public MRFs • Processing centre for dry recyclables	• compatible with existing system, but requires expansion, replacement of existing MRF	• new expanded MRFs	• increased diversion of dry material
Residential Recycling Depots and Transfer Stations • Drop-off depot for dry recyclables • Depots located at transfer stations	• compatible with existing system	• none required	• no effects identified
Residential Promotion and Education • 3Rs promotion and education program • Consumer education program	• new promotion/education program required	• new promotion/education program required	• increased diversion through new promotion/education program

APPENDIX P-5
TABLE 1
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: Wet/Dry
CRITERIA GROUP: Service
CRITERIA: Performance
INDICATOR: Quantity Diverted or Requiring Landfilling

Component Category/ Components	Component Environmental Effects	Mitigation/ Enhancement	Component Net Effects
Garbage Collection and Disposal • Curbside collection of residential garbage from single family dwellings in three stream system • Collection of residential garbage from multi-family units • Self haul of garbage • Regional recycling legislation	• positive effect through reduced waste disposed • all waste collected in three streams - wet - dry - garbage in one collection system	• strong promotion/education program focussed on correct source separation	• increased potential for diversion through source separation
Residential Recycling and Collection • Collection of bins of recyclables from multi-family units • Drop-off depot for multi-family residents not serviced by recycling • Community reducing centres • Recycling at all multi-family buildings of 6 of more units	• positive effect reduces quantity disposed by increasing diversion of organics and dry recyclables • recyclables collected curbside in 3-stream system • possible diversion of 20%-40% of residential waste stream	• promotion/education to ensure proper utilization of new system • strong promotion/education program focussed on correct source separation	• increased potential for diversion through source separation

Residential Leaf and Yard Waste Collection • Curbside collection of leaf and yard waste • Drop-off for leaf and yard waste	• potential to divert 11%-16% of residential waste stream	• strong promotion/education	• increased diversion of organic wastes
Residential Household Composting • Backyard composter distribution programs • Large 3-bin composting units distributed to apartment and cooperative housing complexes • Community composting	• positive effect of complimentary waste diversion initiative • average 100 to 240 kg/hh/yr diverted through residential composting	• maintain current level of residential participation • door-to-door promotion and distribution	• positive effect of increased waste diversion • economic method of waste diversion
Other Residential Waste Diversion (HHW, Toxic Taxi, White Goods Collection, White Goods Drop-off etc.) • Special curbside collections of Christmas trees • Special and weekly curbside collections of white goods • Drop-off depots for white goods • Special curbside collection for bulky items • Permanent drop-off depot for household hazardous waste (HHW) • Special household hazardous waste drop-off days • Toxic Taxi service • Mobile HHW depots	• no effects identified	• none required	• no effects identified

Composting facilities • Centralized windrow composting of leaf and yard waste • In-vessel composting of source separated organics	• positive effect by processing increased quantities of material • contributes to diversion of 11-16% of residential waste stream	• ensure maintenance and proper functioning of existing facilities • may require siting additional facilities or processing agreements with facilities in other regions to accommodate greater quantities of material • promotion/education to encourage high participation and correct source separation	• potential positive effect of processing greater quantities of organic waste • potential impact of siting new composting facility • significant diversion of organics
Reuse Centres and Activities • Municipal reuse centre • Private reuse centre • Non-profit reuse centre • Charitable reuse centres • Food reuse organization • Special goods exchange days	• diverts 1% - 2% of residential waste stream	• promotion/education	• diversion through reuse, which is preferred
Public MRFs • Processing centre for dry recyclables	• processes dry recyclables to divert 20%-40% of residential waste	• promotion/education to encourage correct source separation	• increased diversion of dry recyclables
Residential Recycling Depots and Transfer Stations • Drop-off depot for dry recyclables • Depots located at transfer stations	• diverts 1% to 6% of residential waste stream	• promotion/education	• increased diversion of dry recyclables

Residential Promotion and Education • 3Rs promotion and education program • Consumer education program	• substantial promotion/education needed to ensure effective implementation of new system • diversion achieved through promotion not easily measured	• develop and implement campaign for residential promotion/education • new program for 3 stream	• positive effect of efficient transition to new waste management system • increased diversion through participation in 3-stream

APPENDIX P-6

TABLE 1

GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: Mixed Waste Processing
CRITERIA GROUP: Service
CRITERIA: Reliability
INDICATOR: Proven Technologies Based on Experience in Other Jurisdictions

Component Category/ Components	Component Environmental Effects	Mitigation/ Enhancement	Component Net Effects
Garbage Collection and Disposal • Curbside collection of residential garbage from single family dwellings • Collection of residential garbage from multi-family units • Self haul of garbage • Regional recycling legislation	• no effects identified	• none required	• no effects identified
Residential Recycling and Collection • Curbside collection of Blue Box materials • Expanding curbside collection • Collection of bins of recyclables from multi-family units • Drop-off depot for multi-family residents not serviced by recycling • Community reducing centres • Recycling at all multi-family buildings of 6 or more units • Blue Box recycling mandated • Engineered recycling depot	• potential negative effect if residents assume processing of all of third bag • may reduce source separation of recyclables for collection • potential to divert 20% to 40% of residential waste stream	• promotion/education • maintenance of existing 3R's approach to waste diversion	• potential positive effect of continued waste diversion of high quality recyclables

Mixed Waste Processing System, Reliability (cont'd)

Residential Leaf and Yard Waste Collection • Curbside collection of leaf and yard waste • Drop-off for leaf and yard waste	• potential to divert 11% - 16% of residential waste stream	• none required	• no effects identified
Residential Household Composting • Backyard composter distribution programs • Large 3-bin composting units distributed to apartment and cooperative housing complexes • Community composting	• average diversion of 100-240 kg/hh/yr through residential household composting	• none required	• no effects identified
Other Residential Waste Diversion (HHW, Toxic Taxi, White Goods Collection, White Goods Drop-off etc.) • Special curbside collections of Christmas trees • Special and weekly curbside collections of white goods • Drop-off depots for white goods • Special curbside collection for bulky items • Permanent drop-off depot for household hazardous waste (HHW) • Special household hazardous waste drop-off days • Toxic Taxi service • Mobile HHW depots	• no effects identified	• none required	• no effects identified

<u>Composting facilities</u> • Centralized windrow composting of leaf and yard waste • In-vessel composting of source separated organics • Mixed waste processing and composting of "third bag" waste	• difficulty in siting mixed waste processing plants • on-going problems with technology, processing, odours and marketing end product • potential 10%-35% requirement of landfilling residuals contributes to diversion of 11%-16% of residential waste stream	• extensive process required for siting, locate far from residential neighborhoods • extensive monitoring, careful engineering of plant • adequate start up time to compost materials properly (avoiding odours) • reserve capital fund for retrofits as required	• potential for successful processing of third bag of waste
<u>Reuse Centres and Activities</u> • Municipal reuse centre • Private reuse centre • Non-profit reuse centre • Charitable reuse centres • Food reuse organization • Special goods exchange days	• diverts 1%-2% of residential waste stream	• none required	• no effects identified
<u>Public MRFs</u> • Processing centre for dry recyclables	• processes 20%-40% of residential waste stream	• none required	• no effects identified
<u>Residential Recycling Depots and Transfer Stations</u> • Drop-off depot for dry recyclables • Depots located at transfer stations	• diverts 1%-6% of residential waste stream	• none required	• no effects identified
<u>Residential Promotion and Education</u> • 3Rs promotion and education program • Consumer education program	• substantial new program to announce mixed waste processing program may contribute to waste diversion	• none required	• no effects identified

APPENDIX P-6
TABLE 1
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: Mixed Waste Processing
CRITERIA GROUP: Service
CRITERIA: Reliability
INDICATOR: Degree of Reliance on Single Approach

Component Category/ Components	Component Environmental Effects	Mitigation/ Enhancement	Component Net Effects
Garbage Collection and Disposal • Curbside collection of residential garbage from single family dwellings • Collection of residential garbage from multi-family units • Self haul of garbage • Regional recycling legislation	• no effects identified	• none required	• no effects identified
Residential Recycling and Collection • Curbside collection of Blue Box materials • Expanding curbside collection • Collection of bins of recyclables from multi-family units • Drop-off depot for multi-family residents not serviced by recycling • Community reducing centres • Recycling at all multi-family buildings of 6 or more units • Blue Box recycling mandated • Engineered recycling depot	• no effects identified	• none required	• no effects identified

Residential Leaf and Yard Waste Collection • Curbside collection of leaf and yard waste • Drop-off for leaf and yard waste	• no effects identified	• none required	• no effects identified
Residential Household Composting • Backyard composter distribution programs • Large 3-bin composting units distributed to apartment and cooperative housing complexes • Community composting	• no effects identified	• none required	• no effects identified
Other Residential Waste Diversion (HHW, Toxic Taxi, White Goods Collection, White Goods Drop-off etc.) • Special curbside collections of Christmas trees • Special and weekly curbside collections of white goods • Drop-off depots for white goods • Special curbside collection for bulky items • Permanent drop-off depot for household hazardous waste (HHW) • Special household hazardous waste drop-off days • Toxic Taxi service • Mobile HHW depots	• no effects identified	• none required	• no effects identified

Mixed Waste Processing System, Reliability (cont'd)

Composting facilities • Centralized windrow composting of leaf and yard waste • In vessel composting of source separated organics • Mixed waste processing and composting of "third bag" waste	• potential negative effect in case of facility breakdown, all of third bag would be disposed	• proper maintenance and monitoring to prevent breakdown • promotion of other components to reduce reliance on third bag collection/processing	• potential positive of minimizing plant of plant breakdown • possible positive effect of prevention of plant breakdown
Reuse Centres and Activities • Municipal reuse centre • Private reuse centre • Non-profit reuse centre • Charitable reuse centres • Food reuse organization • Special goods exchange days	• no effects identified	• none required	• no effects identified
Public MRFs • Processing centre for dry recyclables	• same as Existing/Committed	• same as Existing/Committed	• same as Existing/Committed
Residential Recycling Depots and Transfer Stations • Drop-off depot for dry recyclables • Depots located at transfer stations	• no effects identified	• none required	• no effects identified
Residential Promotion and Education • 3Rs promotion and education program • Consumer education program	• no effects identified	• none required	• no effects identified

APPENDIX P-6

TABLE 1

GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: Mixed Waste Processing
CRITERIA GROUP: Service
CRITERIA: Flexibility
INDICATOR: Types and Range of Quantities of Wastes Accepted

Component Category/ Components	Component Environmental Effects	Mitigation/ Enhancement	Component Net Effects
Garbage Collection and Disposal • Curbside collection of residential garbage from single family dwellings • Collection of residential garbage from multi-family units • Self haul of garbage • Regional recycling legislation	• handles full quantity and range of residential waste generated • significant reduction of waste disposed	• none required	• no impact
Residential Recycling and Collection • Curbside collection of Blue Box materials • Expanding curbside collection • Collection of bins of recyclables from multi-family units • Drop-off depot for multi-family residents not serviced by recycling • Community reducing centres • Recycling at all multi-family buildings of 6 or more units • Blue Box recycling mandated • Engineered recycling depot	• same as Existing/Committed	• same as Existing/Committed	• same as Existing/Committed

Residential Leaf and Yard Waste Collection • Curbside collection of leaf and yard waste • Drop-off for leaf and yard waste	• no effects identified	• none required	• no effects identified
Residential Household Composting • Backyard composter distribution programs • Large 3-bin composting units distributed to apartment and cooperative housing complexes • Community composting	• potential negative effect if residents place household organics in third bag • increased high tech processing would lead to increased system environmental effects	• promotion/education to maintain enhance residential participation in sf-hh composting at 80% level	• increased diversion of waste from landfill
Other Residential Waste Diversion (HHW, Toxic Taxi, White Goods Collection, White Goods Drop-off etc.) • Special curbside collections of Christmas trees • Special and weekly curbside collections of white goods • Drop-off depots for white goods • Special curbside collection for bulky items • Permanent drop-off depot for household hazardous waste (HHW) • Special household hazardous waste drop-off days • Toxic Taxi service • Mobile HHW depots	• no effects noted	• none required	• no effects identified

Composting facilities • Centralized windrow composting of leaf and yard waste • In-vessel composting of source separated organics • Mixed waste processing and composting of "third bag" waste	• handles full quantity and range of materials generated by households • positive effect of new facilities accepting wider range, larger quantities of materials	• ensure effective separation/utilization of materials for markets	• potential positive effect of increased diversion of waste from landfill
Reuse Centres and Activities • Municipal reuse centre • Private reuse centre • Non-profit reuse centre • Charitable reuse centres • Food reuse organization • Special goods exchange days	• same as Existing/Committed	• same as Existing/Committed	• same as Existing/Committed
Public MRFs • Processing centre for dry recyclables	• same as Existing/Committed	• same as Existing/Committed	• same as Existing/Committed
Residential Recycling Depots and Transfer Stations • Drop-off depot for dry recyclables • Depots located at transfer stations	• no effects identified	• none required	• no effects identified
Residential Promotion and Education • 3Rs promotion and education program • Consumer education program	• no effects identified	• none required	• no effects identified

APPENDIX P-6
TABLE 1
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: Mixed Waste Processing
CRITERIA GROUP: Service
CRITERIA: Flexibility
INDICATOR: Compatibility with Existing System

Component Category/ Components	Component Environmental Effects	Mitigation/ Enhancement	Component Net Effects
Garbage Collection and Disposal • Curbside collection of residential garbage from single family dwellings • Collection of residential garbage from multi-family units • Self haul of garbage • Regional recycling legislation	• no effects identified	• none required	• no effects identified
Residential Recycling and Collection • Curbside collection of Blue Box materials • Expanding curbside collection • Collection of bins of recyclables from multi-family units • Drop-off depot for multi-family residents not serviced by recycling • Community reducing centres • Recycling at all multi-family buildings of 6 or more units • Blue Box recycling mandated • Engineered recycling depot	• no effects identified	• none required	• no effects identified

Residential Leaf and Yard Waste Collection • Curbside collection of leaf and yard waste • Drop-off for leaf and yard waste	• no effects identified	• none required	• no effects identified
Residential Household Composting • Backyard composter distribution programs • Large 3-bin composting units distributed to apartment and cooperative housing complexes • Community composting	• no effects identified	• none required	• no effects identified
Other Residential Waste Diversion (HHW, Toxic Taxi, White Goods Collection, White Goods Drop-off etc.) • Special curbside collections of Christmas trees • Special and weekly curbside collections of white goods • Drop-off depots for white goods • Special curbside collection for bulky items • Permanent drop-off depot for household hazardous waste (HHW) • Special household hazardous waste drop-off days • Toxic Taxi service • Mobile HHW depots	• no effects identified	• none required	• no effects identified

Composting facilities • Centralized windrow composting of leaf and yard waste • In-vessel composting of source separated organics • Mixed waste processing and composting of "third bag" waste	• can be "add-on" to existing composting, but would lead to inefficient use of facilities • requires new mixed waste processing facility • most effective MSW incorporates RDF which is not consistent with Ontario policy • contradicts Ontario 3Rs approach to waste diversion • will likely result in lower quality compost produced which would be difficult to market under present guidelines	• use system only as a limited "add on" approach to Existing/Committed system	• potential for increased waste diversion through mass reduction in MSW composting
Reuse Centres and Activities • Municipal reuse centre • Private reuse centre • Non-profit reuse centre • Charitable reuse centres • Food reuse organization • Special goods exchange days	• no effects identified	• none required	• no effects identified
Public MRFs • Processing centre for dry recyclables	• no effects identified	• none identified	• no effects identified
Residential Recycling Depots and Transfer Stations • Drop-off depot for dry recyclables • Depots located at transfer stations	• no effects identified	• none required	• no effects identified

<u>Residential Promotion and Education</u> • 3Rs promotion and education program • Consumer education program	• no effects identified	• none required	• no effects identified

APPENDIX P-6
TABLE 1
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: Mixed Waste Processing
CRITERIA GROUP: Service
CRITERIA: Performance
INDICATOR: Quantity Diverted or Requiring Landfilling

Component Category/ Components	Component Environmental Effects	Mitigation/ Enhancement	Component Net Effects
Garbage Collection and Disposal • Curbside collection of residential garbage from single family dwellings • Collection of residential garbage from multi-family units • Self haul of garbage • Regional recycling legislation	• significantly reduced quantity of garbage to disposal • poor quality MSW compost will be landfilled, or used as landfill cover	• process control to produce high quality compost which can be diverted	• increased diversion from disposal
Residential Recycling and Collection • Curbside collection of Blue Box materials • Expanding curbside collection • Collection of bins of recyclables from multi-family units • Drop-off depot for multi-family residents not serviced by recycling • Community reducing centres • Recycling at all multi-family buildings of 6 or more units • Blue Box recycling mandated • Engineered recycling depot	• same as Existing/Committed	• same as Existing/Committed	• same as Existing/Committed

<u>Residential Leaf and Yard Waste Collection</u> • Curbside collection of leaf and yard waste • Drop-off for leaf and yard waste	• same as Existing/Committed	• same as Existing/Committed	• same as Existing/Committed
<u>Residential Household Composting</u> • Backyard composter distribution programs • Large 3-bin composting units distributed to apartment and cooperative housing complexes • Community composting	• same as Existing/Committed	• same as Existing/Committed	• same as Existing/Committed
<u>Other Residential Waste Diversion (HHW, Toxic Taxi, White Goods Collection, White Goods Drop-off etc.)</u> • Special curbside collections of Christmas trees • Special and weekly curbside collections of white goods • Drop-off depots for white goods • Special curbside collection for bulky items • Permanent drop-off depot for household hazardous waste (HHW) • Special household hazardous waste drop-off days • Toxic Taxi service • Mobile HHW depots	• same as Existing/Committed	• same as Existing/Committed	• same as Existing/Committed

Mixed Waste Processing System, Performance (cont'd)

Composting facilities • Centralized windrow composting of leaf and yard waste • In-vessel composting of source separated organics • Mixed waste processing and composting of "third bag" waste	• same as Existing/Committed for leaf and yard waste processing • MSW composting results in significant diversion of residential waste stream • increased diversion through MSW compost • lower quality of end product (compost and recyclables) • potential negative effect due to disposal of unuseable recyclables/organics as residual	• monitor processing systems • upgrade facilities as required • increase pre-separation	• neutral effect
Reuse Centres and Activities • Municipal reuse centre • Private reuse centre • Non-profit reuse centre • Charitable reuse centres • Food reuse organization • Special goods exchange days	• same as Existing/Committed	• same as Existing/Committed	• same as Existing/Committed
Public MRFs • Processing centre for dry recyclables	• same as Existing/Committed	• same as Existing/Committed	• same as Existing/Committed
Residential Recycling Depots and Transfer Stations • Drop-off depot for dry recyclables • Depots located at transfer stations	• no effects identified	• none required	• no effects identified

Residential Promotion and Education • 3Rs promotion and education program • Consumer education program	• same as Existing/Committed	• same as Existing/Committed	• same as Existing/Committed

TABLE DR.1
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Durham

SYSTEM: Residential Existing

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Reliability			
Indicator: Proven technologies based on experience in other jurisdictions	• technology for all components are proven • some operational problems have been identified	• residential Existing System is considered reliable since it is based on proven technology and relies on the integration of several different approaches	<u>Advantages</u> • reliability enhanced because core technology is proven and diverse <u>Disadvantage</u> • experience has demonstrated some reliability problems (eg. odours at compost) which can be mitigated
Indicator: Degree of reliance on single approach	• system is not dependent on single approach		

TABLE DR.1
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Durham

SYSTEM: Residential Existing

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accepted	• Existing System accepts an established range and quantity of recyclable materials that are accommodated in existing facilities	• Durham MRF requires expansion to handle larger quantity and range of materials • collection system (Blue Box) can handle larger quantity and range of materials	<u>Advantages</u> • system can be slightly expanded <u>Disadvantages</u> • flexibility limited by lack of markets for secondary materials
Indicator: Compatibility with Existing System	• not applicable		

TABLE DR.1
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Durham

SYSTEM: Residential Existing

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Performance			
Indicator: Quantity diverted or requiring landfilling	• 27% residential waste diversion achieved in Durham (based on 1992 figures) • 32% with source reduction included	• waste diversion quantities will not meet Ontario targets	Advantages • diversion of waste from landfill Disadvantages • nearly 68% of waste continues to be landfilled

TABLE DR.2
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Durham

SYSTEM: Residential Existing/Committed

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Reliability			
Indicator: Proven technologies based on experience in other jurisdictions	• technology for waste diversion has proven to be effective • some elements (eg composting) may require technical improvements	• elements of system are proven to be reliable • system is not prone to failure by being reliant on a single approach • technological elements have been proven	Advantages • system reliability has been proven • system depends on diverse elements rather than on a single one Disadvantages • some technical difficulties with individual components require attention
Indicator: Degree of reliance on single approach	• combines several approaches to achieve higher waste diversion		

TABLE DR.2
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Durham

SYSTEM: Residential Existing/Committed

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accepted	• MRF is presently operating at capacity and expansion of existing MRF is committed to accommodate increased quantities • no significant change in types or quantities of material accepted	• collection system is flexible and increased quantities of materials can be accepted • Existing/Committed system is compatible with Existing System • processing capacity is being expanded	Advantages • collection system of Existing System compatible with Existing/Committed System Disadvantages • additional quantities require new processing facility or altered systems in existing MRF
Indicator: Compatibility with Existing System	• region's Existing/Committed program calls only for new backyard composters in addition to existing components • expanding Existing Systems (eg.Igloo)		

TABLE DR.2
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Durham

SYSTEM: Residential Existing/Committed

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Performance			
Indicator: Quantity diverted or requiring landfilling	• estimated 28% waste diversion to hold constant until 2000 • 33% waste diversion with source reduction included	• no significant increase in quantities of waste diversion as no new programs committed	Advantages • 32% waste diversion to be achieved Disadvantages • 32% diversion does not meet Ontario waste diversion targets

TABLE DR.3
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Durham

SYSTEM: Direct Cost

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Reliability			
Indicator: Proven technologies based on experience in other jurisdictions	• technology is proven and can be applied in Durham • would result in increased waste diversion	• system is reliable • not dependent on single approach • proven technology and approach • significant increase in waste diversion anticipated	Advantages • proven technology/system for reducing waste • reliable/effective system • based on combination of served proven approaches Disadvantages • waste diversion increases dependent on significant participation by residents
Indicator: Degree of reliance on single approach	• not reliant on a single approach beyond direct cost or similar policy • diversified recycling approaches enhance effectiveness of system • backyard composting integral to system effectiveness • leaf and yard waste composting integral to system effectiveness		

TABLE DR.3
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Durham

SYSTEM: Direct Cost

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accepted	• no significant change in types of materials from Existing/Committed system • quantities collected are likely to rise	• system can accommodate increased quantities of materials • builds on Existing System, does not require fundamental change	Advantages • increased quantity of material diverted • not reliant on increasing range of materials but may do so Disadvantages • may require expansion of existing processing facilities • may require a revised collection schedule or additional trucks to accommodate increased quantities of recyclables
Indicator: Compatibility with Existing System	• compatible with Existing System • may require shift to weekly collection of recyclables • requires heavy residential participation in backyard and household composting • may require expansion of composting facilities		

TABLE DR.3
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Durham

SYSTEM: Direct Cost

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Performance			
Indicator: Quantity diverted or requiring landfilling	• 43% waste diversion possible with 80% single-family and 40% other households composting (assumes first 25% of hhlds divert 240 kg/hhld/yr and remainder divert 100 kg/hh/yr) and multi-family diversion of dry recyclables at 30% to 100% of Quinte capture rate for existing Blue Box materials. 80% of yard waste diverted through curbside and backyard composting • 48% waste diversion possible with composters diverting 240 kg/hhld/yr. • 53% possible with source reduction included	• significant increases in waste diverted from landfill	Advantages • increased waste diversion satisfying Ontario waste diversion targets • builds an existing/committed system Disadvantages • potential for illegal dumping of waste • some assumptions on waste diversion somewhat uncertain

TABLE DR-4
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Durham

SYSTEM: Expanded Blue Box

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Reliability			
Indicator: Proven technologies based on experience in other jurisdictions	• technology is proven and has shown to be reliable in pilot and full scale projects	• Expanded Blue Box is a reliable system that could be implemented in Durham • it has been proven and is not dependent on a single approach	Advantages • combines diverse approaches to enhance reliability Disadvantages • assumes 80% participation in backyard composting • assumes same level of participation and capture rates as Quinte
Indicator: Degree of reliance on single approach	• Expanded Blue Box does not rely on a single approach • reliability is enhanced by combining several approaches (including curbside and depot collection of expanded recyclables, composting etc.)		

TABLE DR.4
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Durham

SYSTEM: Expanded Blue Box

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accepted	• expands range and types of dry materials presently accepted • will result in more material collected	• Expanded Blue Box modifies and enhances Existing System • requires change in curbside collection of recyclables • expands range of materials collected and results in greater quantities of waste diverted	Advantages • enhances Existing System by collecting wider range of greater quantity materials Disadvantages • may require capital expenditures for material processing facilities • requires switch to weakly curbside collection of recyclables
Indicator: Compatibility with Existing System	• compatible with most elements of Existing System • would require using existing or modified systems in the region • continue to promote backyard composting • Region of Durham would need to switch from bi-weekly to weekly blue box collection		

TABLE DR.4
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Durham

SYSTEM: Expanded Blue Box

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Performance			
Indicator: Quantity diverted or requiring landfilling	• 48% waste diversion possible with 80% single-family and 40% other households composting (assumes first 25% of hhlds divert 240 kg/hh/yr and remainder divert 100 kg/hh/yr), and multi-family diversion of Expanded Blue Box materials at 30% to 100% of Quinte capture rate • 56% waste diversion possible with composters diverting 240 kg/hh/yr • 61% possible with source reduction included	• increased waste diversion	Advantages • increased waste diversion Disadvantages • achieving Ontario waste diversion target depends on residents participating in backyard composting • some assumptions on waste diversion somewhat uncertain

TABLE DR.5
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Durham

SYSTEM: Wet/Dry

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Reliability			
Indicator: Proven technologies based on experience in other jurisdictions	• technology is proven in pilot scale projects in Ontario and at full scale in Europe • technical problems with processing (e.g. compost) still exist • compost quality is still a problem	• system considered reliable in some jurisdictions (not Ontario) • combination of several approaches to achieve waste diversion • potential for odours from composting plants can be mitigated through appropriate start-up procedures, careful monitoring and effective technology	<u>Advantages</u> • technology well-developed in Europe • potential for system breakdown is minimal and can be mitigated with public use of other diversion techniques <u>Disadvantages</u> • reliant on a primary approach to waste reduction • not proven at full scale in North America
Indicator: Degree of reliance on single approach	• Wet/Dry relies on a single approach (i.e. two or three stream collection) which also incorporates other 3Rs elements • if unsuccessful, any or all aspects of the approach can be modified on a temporary or long term basis		

TABLE DR-5
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Durham

SYSTEM: Wet/Dry

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator Types and range of [illegible] of waste accepted	• expands range of dry materials collected curbside and results in greater quantities collected • allows collection of wet household waste	• a new MRF or expanded existing MRF would be required to enhance system flexibility and accommodate increased quantities of dry recyclables • new centralized composting facility (probably in-vessel) would be required	Advantages • collection of wider range and greater quantity of materials at curbside • helps divert wet household waste not captured otherwise • elements of Existing System maintained (e.g. backyard composting) Disadvantages • fundamental changes to ways in which waste managed • expanded or new centralized composting facilities will be required • require operational changes for municipality and residents • will require expansion of existing or new MRF
Indicator Compatibility with Existing System	• requires fundamental change in Existing System to two or three stream collection • relies on some elements of Existing System (e.g. backyard compost for further diversion) • requires new municipal and household equipment		

TABLE DR.5
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Durham

SYSTEM: Wet/Dry

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Reliability			
Indicator: Proven technologies based on experience in other jurisdictions	• technology is proven in pilot scale projects in Ontario and at full scale in Europe • technical problems with processing (e.g. compost) still exist • compost quality is still a problem	• system considered reliable in some jurisdictions (not Ontario) • combination of several approaches to achieve waste diversion • potential for odours from composting plants can be mitigated through appropriate start-up procedures, careful monitoring and effective technology	<u>Advantages</u> • technology well-developed in Europe • potential for system breakdown is minimal and can be mitigated with public use of other diversion techniques <u>Disadvantages</u> • reliant on a primary approach to waste reduction • not proven at full scale in North America
Indicator: Degree of reliance on single approach	• Wet/Dry relies on a single approach (i.e. two or three stream collection) which also incorporates other 3Rs elements • if unsuccessful, any or all aspects of the approach can be modified on a temporary or long term basis		

TABLE DR-3
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Durham

SYSTEM: Wet/Dry

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator Types and range of quantities of waste accepted	• expands range of dry materials collected curbside and results in greater quantities collected • allows collection of wet household waste	• a new MRF or expansion of existing MRF would be required to enhance System flexibility and accommodate increased quantities of dry recyclables • new centralized composting facility (probably in-vessel) would be required	Advantages • collection of wider range and greater quantity of materials at curbside • helps divert wet household waste not captured otherwise • elements of Existing System maintained (e.g. backyard composting) Disadvantages • fundamental changes to ways in which waste managed • expanded or new centralized composting facilities will be required • requires operational changes for municipality and residents • will require expansion of existing or new MRF
Indicator Compatibility with Existing System	• requires fundamental change in Existing System to two or three stream collection • relies on some elements of Existing System (e.g. backyard compost for further diversion) • requires new municipal and household equipment		

TABLE DR.5
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Durham

SYSTEM: Wet/Dry

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Performance			
Indicator: Quantity diverted or requiring landfilling	• 61% waste diversion possible with 80% single-family and 40% other households composting. Multi-family diversion of dry recyclables at 30% to 100% of Quinte capture rate for existing Blue Box materials. 80% diversion of food and yard waste from single-family homes and 30% diversion of food waste from all other homes • 64% waste diversion possible with increase to 80% diversion of food waste from all homes. • 69% possible with source reduction included	• potential to increase waste diversion in compliance with provincial targets	<u>Advantage</u> • increased waste diversion to meet Ontario waste diversion targets <u>Disadvantage</u> • some assumptions on waste diversion somewhat uncertain (because system has not been proven at full scale in Ontario).

TABLE DR 6
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Durham

SYSTEM: Mixed Waste Processing (low quality compost)

Criteria Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: **Reliability**			
Indicator: Proven technologies based on experience in other jurisdictions	• successful processing is not yet widely proven	• Mixed Waste Processing system is not considered highly reliable but may be used as an add-on to an existing/committed system • technology not proven and system is partially dependent on a single approach	Advantages • potential for processing waste portion after backyard composting and recycling of other materials Disadvantages • experience has shown processing may fail • not a proven successful technology
Indicator: Degree of reliance on single approach	• reliability limited by dependence on single processing facility for "third bag" waste • potentially mitigated if residents continue to source separate recyclables, organics etc. as at present		

TABLE DR.6
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Durham

SYSTEM: Mixed Waste Processing (low quality compost)

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accepted	• increased quantity of waste processed • may decrease quantity or quality of secondary materials actually marketed or reused	• Mixed Waste Processing offers flexibility to increase range and quantity of materials accepted • high quality processing is questionable • the system is partially compatible with existing collection systems but strongly contradicts existing waste management policy	<u>Advantages</u> • increase in waste diversion through mass reduction in composting process <u>Disadvantages</u> • contradicts existing policy • may decrease value of recyclables • regressive step erodes advances in 3Rs promotion/acceptance by public
Indicator: Compatibility with Existing System	• compatible with general approach of existing committed system • conflicts with existing policy to promote participation in source separation • production of RDF for incineration conflicts with current legislation • requires new processing plants		

TABLE DR-6
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY Durham

SYSTEM Mixed Waste Processing (low quality compost)

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion Performance			
Indicator			
Quantity diverted or requiring landfilling	• 6[illegible]% waste diversion possible with 60% single-family and 40% other households composting (assumes first 25% of hhlds divert 240 kg/hhld/yr and remainder divert 100 kg/hh/yr). Multi-family diversion of dry recyclables at 30% to 100% of Quinte capture rate for existing Blue Box materials • 63% waste diversion possible with composters diverting 240 kg/hh/yr • 68% possible with source reduction included	• increased waste diversion	Advantages • meets Ontario waste diversion targets • a portion of waste currently disposed may be processed for diversion Disadvantages • quantity requiring landfill is unknown due to unproven technology • marketability of materials processed is uncertain

TABLE DR.7
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Durham

SYSTEM: Mixed Waste Processing (high quality compost)

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Reliability			
Indicator: Proven technologies based on experience in other jurisdictions	• successful processing is not yet widely proven	• Mixed Waste Processing system is not considered highly reliable but may be used as an add-on to an existing/committed system • technology not proven and system is partially dependent on a single approach	<u>Advantages</u> • potential for processing waste portion after backyard composting and recycling of other materials <u>Disadvantages</u> • experience has shown processing may fail • not a proven successful technology
Indicator: Degree of reliance on single approach	• reliability limited by dependence on single processing facility for "third bag" waste • potentially mitigated if residents continue to source separate recyclables, organics etc. as at present		

TABLE DR.7
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Durham

SYSTEM: Mixed Waste Processing (high quality compost)

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accepted	• increased quantity of waste processed • may decrease quantity or quality of secondary materials actually marketed or reused	• Mixed Waste Processing offers flexibility to increase range and quantity of materials accepted • high quality processing is questionable • the system is partially compatible with existing collection systems but strongly contradicts existing waste management policy	Advantages • increase in waste diversion through mass reduction in composting process Disadvantages • contradicts existing policy • may decrease value of recyclables • regressive step erodes advances in 3Rs promotion/acceptance by public
Indicator: Compatibility with Existing System	• compatible with general approach of Existing/Committed System • conflicts with existing policy to promote participation in source separation • production of RDF for incineration conflicts with current legislation • requires new processing plants		

TABLE DR.7
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Durham

SYSTEM: Mixed Waste Processing (high quality compost)

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Performance			
Indicator: Quantity diverted or requiring landfilling	• up to 84% waste diversion possible with 80% single family and 40% other households composting (assumes first 25% of hh. divert 240 kg/hh/yr and remainder divert 100 kg/hh/yr) including source reduction	• increased waste diversion	Advantage • meets Ontario waste diversion targets • a portion of waste currently disposed may be processed for diversion Disadvantages • quantity requiring landfill is unknown due to unproven technology • marketability of materials processed is uncertain

TABLE MR.1
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Metro

SYSTEM: Residential Existing

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: **Reliability**			
Indicator: Proven technologies based on experience in other jurisdictions	• technology for all components is proven • some operational problems have been identified	• residential Existing System is considered reliable since it is based on proven technology and relies on the integration of several different approaches	Advantages • system is reliable; core technology is proven and diverse Disadvantage • experience has demonstrated some reliability problems (eg. odours at compost) which can be mitigated
Indicator: Degree of reliance on single approach	• system is not dependent on single approach		

TABLE MR.1
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Metro

SYSTEM: Residential Existing

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accommodated	• Existing System accepts an established range and quantity of recyclable materials that are accommodated in existing facilities	• MRFs can handle larger quantity and range of materials • collection system (Blue Box) can handle larger quantity and range of materials	Advantages • system can be designed to be more flexible • most elements are expandable at present Disadvantages • flexibility limited by lack of markets for secondary materials and size of existing MRF
Indicator: Compatibility with Existing System	• not applicable		

TABLE MR.1
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Metro

SYSTEM: Residential Existing

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Performance			
Indicator: Quantity diverted or requiring landfilling	• 19% residential waste diversion achieved in Durham (based on 1992 figures) • 24% with source reduction included	• waste diversion quantities will not meet Ontario targets	Advantages • diversion of waste from landfill Disadvantages • at best, 76% of waste continues to be landfilled

TABLE MR.2
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Metro

SYSTEM: Residential Existing/Committed

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Reliability			
Indicator: Proven technologies based on experience in other jurisdictions	• most technology and systems for waste diversion have proven to be effective • some elements (eg. composting) require technical improvements or piloting and perfection (eg. multi-family recycling)	• most elements of system are proven to be reliable • system is not prone to failure by being reliant on a single approach • most technological elements have been proven	Advantages • system reliability has been proven • system depends on diverse elements rather than on a single one Disadvantages • some technical difficulties with individual components require attention (e.g. composting and multi-family recycling)
Indicator: Degree of reliance on single approach	• combines several approaches to achieve higher waste diversion		

TABLE MR.2
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Metro

SYSTEM: Residential Existing/Committed

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accommodated	• new MRF will facilitate processing increased quantities (from apartments etc.) • no significant change in types or quantities of material accepted • newly engineered easily accessible large scale depots at landfill or transfer stations will increase quantities collected	• collection system is flexible and increased quantities of materials can be accepted • Existing/Committed system is compatible and expands on Existing System • processing capacity is being expanded	<u>Advantages</u> • no significant changes needed to Existing System <u>Disadvantages</u> • new collection system required to facilitate centralized composting
Indicator: Compatibility with Existing System	• Metro's Existing/Committed program calls only for new backyard composters and new large scale drop-off depots at landfills, in addition to existing components • exisiting collection system not compatible with new centralized composting facility.		

TABLE MR.2
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Metro

SYSTEM: Residential Existing/Committed

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Performance			
Indicator: Quantity diverted or requiring landfilling	• estimated 21% waste diversion to hold constant until 2000 • 26% waste diversion with source reduction included	• no significant increase in quantities of waste diversion as no new programs committed	Advantages • 26% waste diversion to be achieved Disadvantages • 26% diversion does not meet Ontario waste diversion targets

TABLE MR.3
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Metro

SYSTEM: Direct Cost

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Reliability			
Indicator: Proven technologies based on experience in other jurisdictions	• most technology is proven and can be applied in Metro • would result in increased waste diversion	• system is reliable • not dependent on single approach • proven technology and approach • significant increase in waste diversion anticipated	Advantages • proven technology/system for reducing waste • reliable/effective system • based on combination of several proven approaches • waste diversion increases Disadvantages • dependent on significant participation by residents • Could increase illegal dumping
Indicator: Degree of reliance on single approach	• not reliant on a single approach beyond direct cost or similar policy • diversified recycling approaches enhance effectiveness of system • backyard composting integral to system effectiveness • leaf and yard waste composting integral to system effectiveness		

TABLE MR.3
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Metro

SYSTEM: Direct Cost

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accommodated	• no significant change in types of materials from Existing/Committed system • quantities of recyclable materials collected are likely to rise	• Existing/Committed system can accommodate increased quantities of materials • builds on Existing System, does not require fundamental change • difficult to implement in multi-family buildings, of which there are many in Metro	<u>Advantages</u> • increased quantity of material diverted • not reliant on increasing range of materials but may do so <u>Disadvantages</u> • may require expansion of existing processing facilities • may require a revised collection schedule or additional trucks to accommodate increased quantities of recyclables
Indicator: Compatibility with Existing System	• compatible with Existing System • requires heavy residential participation in backyard and household composting • existing/committed composting facilities adequate to accommodate increased demand		

TABLE MR.3
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Metro

SYSTEM: Direct Cost

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Performance			
Indicator: Quantity diverted or requiring landfilling	• 33% waste diversion possible with 80% single-family and 40% other households composting (assumes first 25% of hhlds divert 240 kg/hhld/yr and remainder divert 100 kg/hh/yr). Multi-family diversion of existing Blue Box materials at 30% to 100% of Quinte capture rate. 80% of yard waste diverted through curbside and backyard composting • 42% waste diversion possible with all backyard composters diverting 240 kg/hhld/yr. • 47% possible with source reduction included	• significant increases in waste diverted from landfill	Advantages • build on Existing/Committed system Disadvantages • does not meet Ontario waste diversion target • potential for illegal dumping of waste • some assumptions on waste diversion somewhat uncertain

TABLE MR-4
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Metro

SYSTEM: Expanded Blue Box

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Reliability			
Indicator: Proven technologies based on experience in other jurisdictions	• technology is proven and has shown to be reliable in pilot and full scale projects • partial expansion of blue box materials accepted has already proven successful in Peel	• Expanded Blue Box is a reliable system that could be fully implemented in Metro • technology has been proven and is not dependent on a single approach	Advantages • combines diverse approaches to enhance reliability Disadvantages • assumes 80% participation in backyard composting • assumes 80% diversion of leaf and yard waste • assumes same level of participation and capture rates as Quinte • markets may be limited for some materials
Indicator: Degree of reliance on single approach	• Expanded Blue Box does not rely on a single approach • reliability is enhanced by combining several approaches (including curbside and depot collection of expanded recyclables, composting etc.)		

TABLE MR.4
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Metro

SYSTEM: Expanded Blue Box

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accommodated	• expands range and types of dry materials presently accepted • will result in more material collected	• Expanded Blue Box modifies and enhances Existing/Committed system • requires additional change in curbside collection of recyclables • expands range of materials collected and results in greater quantities of waste diverted	Advantages • enhances Existing/Committed system by collecting wider range and greater quantity of materials Disadvantages • requires further modification to Existing/Committed and public participation in additional source separation • does not address large portion of organic waste from apartments
Indicator: Compatibility with Existing System	• compatible with most elements of Existing System • would require using existing or modified systems in the region • continue to promote backyard composting		

TABLE MR.4
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Metro

SYSTEM: Expanded Blue Box

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Performance			
Indicator: Quantity diverted or requiring landfilling	• 48% waste diversion possible with 80% single-family and 40% other households composting (assumes first 25% of hhlds divert 240 kg/hh/yr and remainder divert 100 kg/hh/yr) plus multi-family diversion of Expanded Blue Box materials at 30% to 100% of Quinte capture rate • 56% waste diversion possible with all backyard composters diverting 240 kg/hh/yr. • 61% possible with source reduction included	• increased waste diversion	<u>Advantages</u> • increased waste diversion <u>Disadvantages</u> • achieving Ontario waste diversion target depends on residents participating in backyard composting, leaf and yard waste composting and in source reduction • some assumptions on waste diversion somewhat uncertain

TABLE MR.5
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Metro

SYSTEM: Wet/Dry

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Reliability			
Indicator: Proven technologies based on experience in other jurisdictions	• technology is proven in pilot scale projects in Ontario and at full scale in Europe • technical problems with processing (e.g. compost) still exist • compost quality is still a problem	• system considered reliable in some jurisdictions (not Ontario) • combination of several approaches to achieve waste diversion • potential for odours from composting plants can be mitigated through appropriate start-up procedures, careful monitoring and effective technology	<u>Advantages</u> • technology well-developed for Europe • potential for system breakdown is minimal and can be mitigated with public use of other diversion techniques <u>Disadvantages</u> • reliant on a primary approach to waste reduction • not proven at full scale in North America
Indicator: Degree of reliance on single approach	• Wet/Dry relies on a single approach (i.e. two or three stream collection) which also incorporates other 3Rs elements • if unsuccessful, any or all aspects of the approach can be modified on a temporary or long term basis		

TABLE MR.5
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Metro

SYSTEM: Wet/Dry

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accommodated	• expands range of dry recyclable materials collected curbside and results in greater quantities collected • allows curbside collection of wet household waste	• expansion of the existing MRFs would be required to enhance system flexibility and accommodate increased quantities of dry recyclables • may be problems in implementing in apartment buildings	Advantages • collection of wider range and greater quantity of materials at curbside • compatible with existing plans for central in-vessel composting facility • helps divert wet household waste not captured otherwise • elements of Existing Systems maintained (eg. backyard composting) Disadvantages • fundamental changes to ways in which waste managed • require operational changes for municipality and residents • expansion of existing MRFs • markets for increased variety of materials may be limited
Indicator: Compatibility with Existing System	• requires fundamental change in Existing System to two or three stream collection • relies on some elements of Existing Systems (eg. backyard compost and participation in leaf and yard waste collection for further diversion) • requires new municipal and household equipment		

TABLE MR.5
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Metro

SYSTEM: Wet/Dry

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Performance			
Indicator: Quantity diverted or requiring landfilling	• 49% waste diversion possible with 80% single-family and 40% other households composting plus multi-family diversion of existing Blue Box materials at 30% to 100% of Quinte capture rate. 80% diversion of food and yard waste from single family homes, 30% diversion of food waste from other homes. • 62% waste diversion possible with increase to 80% diversion of food waste from all homes • 67% possible with source reduction included	• potential to increase waste diversion in compliance with provincial targets	Advantage • increased waste diversion to meet Ontario waste diversion targets Disadvantage • some assumptions on waste diversion somewhat uncertain (because it has not been proven out full scale in Ontario).

TABLE MR.6
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Metro

SYSTEM: Mixed Waste Processing (low quality compost)

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Reliability			
Indicator: Proven technologies based on experience in other jurisdictions	• successful processing is not yet widely proven	• Mixed Waste Processing system is not considered highly reliable but may be used as an add-on to an existing/committed system • technology not proven and system is partially dependent on a single approach	Advantages • potential for processing waste remaining after backyard composting and recycling of other materials Disadvantages • experience has shown processing may fail • not a proven successful technology
Indicator: Degree of reliance on single approach	• reliability limited by dependence on single processing facility for "third bag" waste • potentially mitigated if residents continue to source separate recyclables, organics etc. as at present		

TABLE MR.6
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Metro

SYSTEM: Mixed Waste Processing (low quality compost)

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accommodated	• increased quantity of waste processed • may decrease quantity or quality of secondary materials actually marketed or reused	• Mixed Waste Processing offers flexibility to increase range and quantity of materials accepted • high quality processing is questionable • potentially more suited to large number of apartment buildings in Metro than Wet/Dry • the system is partially compatible with Existing/Committed collection systems but strongly contradicts existing waste management policy	<u>Advantages</u> • increase in waste diversion through mass reduction in composting process <u>Disadvantages</u> • contradicts existing policy • may decrease value of recyclables • regressive step erodes advances in 3Rs promotion/acceptance by public
Indicator: Compatibility with Existing System	• compatible with general approach of Existing/Committed system • conflicts with existing policy to promote participation in source separation • requires new mixed solid waste processing plant		

TABLE MR.6
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Metro

SYSTEM: Mixed Waste Processing (low quality compost)

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Performance			
Indicator: Quantity diverted or requiring landfilling	• 54% waste diversion possible with 80% single-family and 40% other households composting (assumes first 25% of hhlds divert 240 kg/hhld/yr and remainder divert 100 kg/hh/yr). Multi-family diversion of Existing Blue Box dry recyclables at 30% to 100% of Quinte capture rate • 55% waste diversion possible with all backyard composters diverting 240 kg/hh/yr • 60% waste diversion possible with source reduction included	• increased waste diversion	<u>Advantage</u> • meets Ontario waste diversion targets • a portion of waste currently disposed may be processed for diversion <u>Disadvantages</u> • quantity requiring landfill is unknown due to unproven technology • marketability of materials processed is uncertain

TABLE MR.6
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Metro

SYSTEM: Mixed Waste Processing (high quality compost)

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Reliability			
Indicator: Proven technologies based on experience in other jurisdictions	• successful processing is not yet widely proven	• Mixed Waste Processing system is not considered highly reliable but may be used as an add-on to an existing/committed system • technology not proven and system is partially dependent on a single approach	<u>Advantages</u> • potential for processing waste remaining after backyard composting and recycling of other materials <u>Disadvantages</u> • experience has shown processing may fail • not a proven successful technology
Indicator: Degree of reliance on single approach	• reliability limited by dependence on single processing facility for "third bag" waste • potentially mitigated if residents continue to source separate recyclables, organics etc. as at present		

TABLE MR.6
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Metro

SYSTEM: Mixed Waste Processing (high quality compost)

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accommodated	• increased quantity of waste processed • may decrease quantity or quality of secondary materials actually marketed or reused	• Mixed Waste Processing offers flexibility to increase range and quantity of materials accepted • high quality processing is questionable • potentially more suited to large number of apartment buildings in Metro than Wet/Dry • the system is partially compatible with Existing/Committed collection systems but strongly contradicts existing waste management policy	<u>Advantages</u> • increase in waste diversion through mass reduction in composting process <u>Disadvantages</u> • contradicts existing policy • may decrease value of recyclables • regressive step erodes advances in 3Rs promotion/acceptance by public
Indicator: Compatibility with Existing System	• compatible with general approach of Existing/Committed system • conflicts with existing policy to promote participation in source separation • requires new mixed solid waste processing plant		

TABLE MR.6
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Metro

SYSTEM: Mixed Waste Processing (high quality compost)

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Performance			
Indicator: Quantity diverted or requiring landfilling	• up to 79% waste diversion possible with 80% single-family and 40% other households composting and all composters diverting 240 kg/hhld/yr (source reduction included).	• increased waste diversion	Advantage • meets Ontario waste diversion targets • a portion of waste currently disposed may be processed for diversion Disadvantages • quantity requiring landfill is unknown due to unproven technology • marketability of materials processed is uncertain

TABLE YR.1
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: York

SYSTEM: Residential Existing

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Reliability			
Indicator: Proven technologies based on experience in other jurisdictions	• technology for all components are proven	• residential Existing System is considered reliable since it is based on proven technology and relies on the integration of several different approaches	Advantages • system is reliable; core technology is proven and diverse
Indicator: Degree of reliance on single approach	• system is not dependent on single approach		

TABLE YR.1
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: York

SYSTEM: Residential Existing

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accommodated	• Existing System accepts an established range and quantity of recyclable materials that are accommodated in existing facilities • ranges and quantities are expanding in partially expanded blue box program	• collection system (Blue Box) can handle larger quantity and range of materials	Advantages • system can be designed to be more flexible • most elements are expandable at present Disadvantages • flexibility limited by lack of markets for secondary materials and size of existing MRF
Indicator: Compatibility with Existing System	• not applicable		

TABLE YR.1
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: York

SYSTEM: Residential Existing

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: **Performance**			
Indicator: Quantity diverted or requiring landfilling	• 28% residential waste diversion achieved in Durham (based on 1992 figures) • 33% with source reduction included	• waste diversion quantities will not meet Ontario targets	Advantages • diversion of waste from landfill Disadvantages • at best, 67% of waste continues to be landfilled

TABLE YR.2
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: York

SYSTEM: Residential Existing/Committed

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Reliability			
Indicator: Proven technologies based on experience in other jurisdictions	• most technology and systems for waste diversion have proven to be effective	• most elements of system are proven to be reliable • system is not prone to failure by being reliant on a single approach • most technological elements have been proven	Advantages • system reliability has been proven • system depends on diverse elements rather than on a single one
Indicator: Degree of reliance on single approach	• combines several approaches to achieve higher waste diversion		

TABLE YR.2
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: York

SYSTEM: Residential Existing/Committed

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accommodated	• Capacity of new MRF limits it from handling additional quantities of material • no significant change in types or quantities of material accepted	• collection system can handle increased quantities of materials but would require coordinating the several different private haulers contracted by the individual municipalities to collect their wastes. • Existing/Committed System is compatible and expands on Existing System • processing capacity is being expanded only minimally	Advantages • no significant changes needed to existing collection system, although increased coordination required Disadvantages • additional quantities require new processing facility or altered systems in existing MRF
Indicator: Compatibility with Existing System	• region's Existing/Committed program calls only for new backyard composters in addition to expansion of HHW program and minimal centralized composting for residential waste. • expanding Existing Systems (eg.Igloo)		

TABLE YR.2
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: York

SYSTEM: Residential Existing/Committed

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Performance			
Indicator: Quantity diverted or requiring landfilling	• estimated 28% waste diversion to hold constant until 2000 • 33% waste diversion with source reduction included	• no increase in quantities of waste diversion as no new programs committed	Advantages • 33% waste diversion to be achieved Disadvantages • 33% diversion does not meet Ontario waste diversion targets

TABLE YR.3
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: York

SYSTEM: Direct Cost

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Reliability			
Indicator: Proven technologies based on experience in other jurisdictions	• technology is proven and can be applied in York • would result in increased waste diversion	• system is reliable • not dependent on single approach • proven technology and approach • significant increase in waste diversion anticipated	Advantages • proven technology/system for reducing waste • reliable/effective system • based on combination of served proven approaches • waste diversion increases Disadvantages • dependent on significant participation by residents
Indicator: Degree of reliance on single approach	• not reliant on a single approach beyond direct cost or similar policy • diversified recycling approaches enhance effectiveness of system • backyard composting integral to system effectiveness • leaf and yard waste composting integral to system effectiveness		

TABLE YR.3
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: York

SYSTEM: Direct Cost

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accommodated	• no significant change in types of materials from Existing/Committed system • quantities of recyclable materials collected are likely to rise	• Existing/Committed system can accommodate increased quantities of materials • builds on Existing System; does not require fundamental change	<u>Advantages</u> • increased quantity of material diverted • not reliant on increasing range of materials but may do so <u>Disadvantages</u> • may require expansion of existing processing facilities • may require a revised collection schedule or additional trucks to accommodate increased quantities of recyclables
Indicator: Compatibility with Existing System	• compatible with Existing System • requires heavy residential participation in backyard and household composting • expanded MRF would be required • collection would have to be organized among many different haulers.		

TABLE YR.3
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: York

SYSTEM: Direct Cost

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Performance			
Indicator: Quantity diverted or requiring landfilling	• 44% waste diversion possible with 80% single-family and 40% other households composting (assumes first 25% of hhlds divert 240 kg/hhld/yr and remainder divert 100 kg/hh/yr). Multi-family diversion of existing Blue Box materials at 30% to 100% of Quinte capture rate and 80% of yard waste diverted through curbside and backyard composting • 50% waste diversion possible with composters diverting 240 kg/hhld/yr • 55% waste diversion possible with source reduction included	• significant increases in waste diverted from landfill	Advantages • increased waste diversion would meet Ontario waste diversion targets • builds on Existing/Committed System Disadvantages • potential for illegal dumping of waste • some assumptions on waste diversion somewhat uncertain

TABLE YR.4
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: York

SYSTEM: Expanded Blue Box

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Reliability			
Indicator: Proven technologies based on experience in other jurisdictions	• technology is proven and has shown to be reliable in pilot and full scale projects • Markham is successfully collecting expanded range of materials through its depot system	• Expanded Blue Box is a reliable system that could be fully implemented in York • technology has been proven and is not dependent on a single approach	Advantages • combines diverse approaches to enhance reliability Disadvantages • assumes 80% participation in backyard composting • assumes 80% diversion of leaf and yard waste • assumes same level of participation and capture rates as Quinte
Indicator: Degree of reliance on single approach	• Expanded Blue Box does not rely on a single approach • reliability is enhanced by combining several approaches (including curbside and depot collection of expanded recyclables, composting etc.)		

TABLE YR.4
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: York

SYSTEM: Expanded Blue Box

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accommodated	• expands range and types of dry materials presently accepted • will result in more material collected	• Expanded Blue Box modifies and enhances Existing/Committed system • requires additional change in curbside collection of recyclables • expands range of materials collected and results in greater quantities of waste diverted	Advantages • enhances Existing/Committed system by collecting wider range and greater quantity of materials Disadvantages • requires further modification to Existing/Committed and public participation in additional source separation
Indicator: Compatibility with Existing System	• compatible with most elements of Existing System • would require coordinated modification of the collection system in the region • continue to promote backyard composting		

TABLE YR.4
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: York

SYSTEM: Expanded Blue Box

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Performance			
Indicator: Quantity diverted or requiring landfilling	• 49% waste diversion possible with 80% single-family and 40% other households composting (assumes first 25% of hhlds divert 240 kg/hh/yr and remainder divert 100 kg/hh/yr). Multi-family diversion of Expanded Blue Box materials at 30% to 100% of Quinte capture rate • 56% waste diversion possible with composters diverting 240 kg/hh/yr • 61% possible with source reduction included	• increased waste diversion	Advantages • increased waste diversion Disadvantages • achieving Ontario waste diversion target depends on residents participating in backyard composting and leaf and yard waste composting • some assumptions on waste diversion somewhat uncertain

TABLE YR.5
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: York

SYSTEM: Wet/Dry

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Reliability			
Indicator: Proven technologies based on experience in other jurisdictions	• technology is proven in pilot scale projects in Ontario and at full scale in Europe • technical problems with processing (e.g. compost) still exist • compost quality is still a problem	• system considered reliable in some jurisdictions (not Ontario) • combination of several approaches to achieve waste diversion • potential for odours from composting plants can be mitigated through appropriate start-up procedures, careful monitoring and effective technology	<u>Advantages</u> • technology well-developed for Europe • potential for system breakdown is minimal and can be mitigated with public use of other diversion techniques <u>Disadvantages</u> • reliant on a primary approach to waste reduction • not proven at full scale in North America
Indicator: Degree of reliance on single approach	• Wet/Dry relies on a single approach (i.e. two or three stream collection) which also incorporates other 3Rs elements • if unsuccessful, any or all aspects of the approach can be modified on a temporary or long term basis		

TABLE YR.5
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: York

SYSTEM: Wet/Dry

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accommodated	• expands range of dry recyclable materials collected curbside and results in greater quantities collected • allows curbside collection of wet household waste	• expansion of the planned new MRF would be required to enhance system flexibility and accommodate increased quantities of dry recyclables • expanded centralized composting facility (probably in-vessel) would be required • collection system would have to be arranged with individual haulers	<u>Advantages</u> • collection of wider range and greater quantity of materials at curbside • helps divert wet household waste not captured otherwise • elements of Existing Systems maintained (eg. backyard composting) <u>Disadvantages</u> • fundamental changes to ways in which waste managed • expanded centralized composting facilities will be required • require operational changes for municipality and residents • will require expansion of planned MRF
Indicator: Compatibility with Existing System	• requires fundamental change in Existing System to two or three stream collection • relies on some elements of Existing Systems (eg. backyard compost and participation in leaf and yard waste collection for further diversion) • requires new municipal and household equipment		

TABLE YR.5
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: York

SYSTEM: Wet/Dry

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Performance			
Indicator: Quantity diverted or requiring landfilling	• 49% waste diversion possible with 80% single-family and 40% other households composting plus multi-family diversion of existing Blue Box materials at 30% to 100% of Quinte capture rate and 80% of yard and food waste from single family homes diverted through curbside and backyard composting. Multi-family diversion of 30% of food (wet) waste. • 56% waste diversion possible with composters diverting 240 kg/hh/yr, multi-famiy diversion increased to 80% of food waste • 61% possible with source reduction included	• potential to increase waste diversion in compliance with provincial targets	Advantage • increased waste diversion to meet Ontario waste diversion targets Disadvantage • some assumptions on waste diversion somewhat uncertain (because it has not been proven at full scale in Ontario).

TABLE YR.6
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: York

SYSTEM: Mixed Waste Processing (low quality compost)

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Reliability			
Indicator: Proven technologies based on experience in other jurisdictions	• successful processing is not yet widely proven	• Mixed Waste Processing system is not considered highly reliable but may be used as an add-on to an Existing/Committed system • technology not proven and system is partially dependent on a single approach	Advantages • potential for processing waste remaining after backyard composting and recycling of other materials Disadvantages • experience has shown processing may fail • not a proven successful technology
Indicator: Degree of reliance on single approach	• reliability limited by dependence on single processing facility for "third bag" waste • potentially mitigated if residents continue to source separate recyclables, organics etc. as at present		

TABLE YR.6
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: York

SYSTEM: Mixed Waste Processing (low quality compost)

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accommodated	• increased quantity of waste processed • may decrease quantity or quality of secondary materials actually marketed or reused	• Mixed Waste Processing offers flexibility to increase range and quantity of materials accepted • high quality processing is questionable • the system is partially compatible with Existing/Committed collection systems but strongly contradicts existing waste management policy	<u>Advantages</u> • increase in waste diversion through mass reduction in composting process <u>Disadvantages</u> • contradicts existing policy • may decrease value of recyclables • regressive step erodes advances in 3Rs promotion/acceptance by public
Indicator: Compatibility with Existing System	• compatible with general approach of Existing/Committed System • conflicts with existing policy to promote participation in source separation • requires new mixed solid waste processing plant		

TABLE YR.6
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: York

SYSTEM: Mixed Waste Processing (low quality compost)

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Performance			
Indicator: Quantity diverted or requiring landfilling	• 60% waste diversion possible with 80% single-family and 40% other households composting (assumes first 25% of hhlds divert 240 kg/hhld/yr and remainder divert 100 kg/hh/yr). Multi-family diversion of Existing Blue Box materials dry recyclables at 30% to 100% of Quinte capture rate • 68% waste diversion possible with all backyard composters diverting 240 kg/hh/yr • 73% possible with source reduction included	• increased waste diversion	Advantage • meets Ontario waste diversion targets • a portion of waste currently disposed may be processed for diversion Disadvantages • quantity requiring landfill is unknown due to unproven technology • marketability of materials processed is uncertain

TABLE YR.6
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: York

SYSTEM: Mixed Waste Processing (high quality compost)

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: **Reliability**			
Indicator: Proven technologies based on experience in other jurisdictions	• successful processing is not yet widely proven	• mixed waste processing system is not considered highly reliable but may be used as an add-on to an Existing/Committed System • technology not proven and system is partially dependent on a single approach	<u>Advantages</u> • potential for processing waste portion after backyard composting and recycling of other materials <u>Disadvantages</u> • experience has shown processing may fail • not a proven successful technology
Indicator: Degree of reliance on single approach	• reliability limited by dependence on single processing facility for "third bag" waste • potentially mitigated if residents continue to source separate recyclables, organics etc. as at present		

TABLE YR.6
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: York

SYSTEM: Mixed Waste Processing (high quality compost)

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accommodated	• increased quantity of waste processed • may decrease quantity or quality of secondary materials actually marketed or reused	• mixed waste processing offers flexibility to increase range and quantity of materials accepted • high quality processing is questionable • the system is partially compatible with Existing/Committed collection systems but strongly contradicts existing waste management policy	<u>Advantages</u> • increase in waste diversion through mass reduction in composting process <u>Disadvantages</u> • contradicts existing policy • may decrease value of recyclables • regressive step erodes advances in 3Rs promotion/acceptance by public
Indicator: Compatibility with Existing System	• compatible with general approach of Existing/Committed System • conflicts with existing policy to promote participation in source separation • requires new mixed solid waste processing plant		

TABLE YR.6
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: York

SYSTEM: Mixed Waste Processing (high quality compost)

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Performance			
Indicator: Quantity diverted or requiring landfilling	• up to 83% waste diversion possible with 80% single-family and 40% other households composting at 240 kg/hhld/yr (inlcuding source reduction).	• increased waste diversion	<u>Advantage</u> • meets Ontario waste diversion targets • a portion of waste currently disposed may be processed for diversion <u>Disadvantages</u> • quantity requiring landfill is unknown due to unproven technology • marketability of materials processed is uncertain

TABLE PR.1
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Peel

SYSTEM: Residential Existing

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Reliability			
Indicator: Proven technologies based on experience in other jurisdictions	• technology for all components are proven • some operational problems have been identified	• residential Existing System is considered reliable since it is based on proven technology and relies on the integration of several different approaches	<u>Advantages</u> • system is reliable; core technology is proven and diverse <u>Disadvantage</u> • experience has demonstrated some reliability problems (eg. odours at compost) which can be mitigated
Indicator: Degree of reliance on single approach	• system is not dependent on single approach		

TABLE PR.1
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Peel

SYSTEM: Residential Existing

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accommodated	• Existing System accepts an established range and quantity of recyclable materials that are accommodated in existing facilities • ranges and quantities are expanding in partially expanded blue box program	• Peel requires a new or expanded MRF to handle larger quantity and range of materials • collection system (Blue Box) can handle larger quantity and range of materials	<u>Advantages</u> • system can be designed to be more flexible • most elements are expandable at present <u>Disadvantages</u> • flexibility limited by lack of markets for secondary materials and size of existing MRF
Indicator: Compatibility with Existing System	• not applicable		

TABLE PR.1
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Peel

SYSTEM: Residential Existing

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Performance			
Indicator: Quantity diverted or requiring landfilling	• 20% residential waste diversion achieved in Durham (based on 1992 figures) • 25% with source reduction included	• waste diversion quantities will not meet Ontario targets	Advantages • diversion of waste from landfill Disadvantages • at best, 75% of waste continues to be landfilled

TABLE PR.2
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Peel

SYSTEM: Residential Existing/Committed

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Reliability			
Indicator: Proven technologies based on experience in other jurisdictions	• most technology and systems for waste diversion have proven to be effective • some elements (eg composting) require technical improvements or piloting and perfection (eg multi-family recycling)	• most elements of system are proven to be reliable • system is not prone to failure by being reliant on a single approach • most technological elements have been proven	Advantages • system reliability has been proven • system depends on diverse elements rather than on a single one Disadvantages • some technical difficulties with individual components require attention (e g composting and multi-family recycling)
Indicator: Degree of reliance on single approach	• combines several approaches to achieve higher waste diversion		

TABLE PR.2
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Peel

SYSTEM: Residential Existing/Committed

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accommodated	• MRF is presently operating at capacity and a new regional MRF is committed to accommodate increased quantities (from apartments etc.) • no significant change in types or quantities of material accepted • expanded recycling waste collection service with community recycling centres, mini depots and satellite facilities	• collection system is flexible and increased quantities of materials can be accepted • committed system is compatible and expands Existing System • processing capacity is being expanded	<u>Advantages</u> • no significant changes to collection system required <u>Disadvantages</u> • additional quantities require new processing facility or altered systems in existing MRF
Indicator: Compatibility with Existing System	• region's Existing/Committed program calls only for new backyard composters in addition to existing components • expanding Existing Systems (eg. Igloo)		

TABLE PR.2
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Peel

SYSTEM: Residential Existing/Committed

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Performance			
Indicator: Quantity diverted or requiring landfilling	• estimated 25% waste diversion to hold constant until 2000 • 30% waste diversion with source reduction included	• no significant increase in quantities of waste diversion as no new programs committed	Advantages • 30% waste diversion to be achieved Disadvantages • 30% diversion does not meet Ontario waste diversion targets

TABLE PR.3
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Peel

SYSTEM: Direct Cost

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Reliability			
Indicator: Proven technologies based on experience in other jurisdictions	• technology is proven and can be applied in Peel • would result in increased waste diversion	• system is reliable • not dependent on single approach • proven technology and approach • significant increase in waste diversion anticipated	Advantages • proven technology/system for reducing waste • reliable/effective system • based on combination of served proven approaches • waste diversion increases Disadvantages • dependent on significant participation by residents
Indicator: Degree of reliance on single approach	• not reliant on a single approach beyond Direct Cost or similar policy • diversified recycling approaches enhance effectiveness of system • backyard composting integral to system effectiveness • leaf and yard waste composting integral to system effectiveness		

TABLE PR.3
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Peel

SYSTEM: Direct Cost

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accommodated	• no significant change in types of materials from Existing/Committed system • quantities of recyclable materials collected are likely to rise	• Existing/Committed system can accommodate increased quantities of materials • builds on Existing System, does not require fundamental change	Advantages • increased quantity of material diverted • not reliant on increasing range of materials but may do so Disadvantages • may require expansion of existing, processing facilities • may require a revised collection schedule or additional trucks to accommodate increased quantities of recyclables
Indicator: Compatibility with Existing System	• compatible with Existing System • requires heavy residential participation in backyard and household composting • Existing/Committed composting facilities adequate to accommodate increased demand		

TABLE PR.3
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Peel

SYSTEM: Direct Cost

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Performance			
Indicator: Quantity diverted or requiring landfilling	• 40% waste diversion possible with 80% single-family and 40% other households composting (assumes first 25% of hhlds divert 240 kg/hhld/yr and remainder divert 100 kg/hh/yr). Multi-family diversion of existing Blue Box materials at 30% to 100% of Quinte capture rate. 80% of yard waste diverted through curbside and backyard composting • 47% waste diversion possible with composters diverting 240 kg/hhld/yr • 52% possible with source reduction included	• significant increases in waste diverted from landfill	<u>Advantages</u> • increased waste diversion would meet Ontario waste diversion target • builds on existing/committed system <u>Disadvantages</u> • potential for illegal dumping of waste • some assumptions on waste diversion somewhat uncertain

TABLE PR.4
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Peel

SYSTEM: Expanded Blue Box

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Reliability			
Indicator: Proven technologies based on experience in other jurisdictions	• technology is proven and has shown to be reliable in pilot and full scale projects • partial expansion of blue box materials accepted in Peel has proven successful already in Peel	• Expanded Blue Box is a reliable system that could be fully implemented in Peel • technology has been proven and is not dependent on a single approach	Advantages • combines diverse approaches to enhance reliability Disadvantages • assumes 80% participation in backyard composting • assumes 80% diversion of leaf and yard waste • assumes same level of participation and capture rates as Quinte
Indicator: Degree of reliance on single approach	• Expanded Blue Box does not rely on a single approach • reliability is enhanced by combining several approaches (including curbside and depot collection of expanded recyclables, composting etc.)		

TABLE PR.4
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Peel

SYSTEM: Expanded Blue Box

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accommodated	• expands range and types of dry materials presently accepted • will result in more material collected	• Expanded Blue Box modifies and enhances Existing/Committed system • requires additional change in curbside collection of recyclables • expands range of materials collected and results in greater quantities of waste diverted	Advantages • enhances Existing/Committed system by collecting wider range and greater quantity of materials Disadvantages • requires further modification to Existing/Committed and public participation in additional source separation
Indicator: Compatibility with Existing System	• compatible with most elements of Existing System • would require using Existing or modified systems in the region • continue to promote backyard composting		

TABLE PR.4
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Peel

SYSTEM: Expanded Blue Box

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Performance			
Indicator: Quantity diverted or requiring landfilling	• 38% waste diversion possible with 80% single-family and 40% other households composting (assumes first 25% of hhlds divert 240 kg/hh/yr and remainder divert 100 kg/hh/yr). Multi-family divert Expanded Blue Box materials at 30% to 100% of Quinte capture rate • 48% waste diversion possible with composters diverting 240 kg/hh/yr • 53% possible with source reduction included	• increased waste diversion	<u>Advantages</u> • increased waste diversion <u>Disadvantages</u> • achieving Ontario waste diversion target depends on residents participating in backyard composting and leaf and yard waste composting • some assumptions on waste diversion somewhat uncertain

TABLE PR.5
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Peel

SYSTEM: Wet/Dry

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Reliability			
Indicator: Proven technologies based on experience in other jurisdictions	• technology is proven in pilot scale projects in Ontario and at full scale in Europe • technical problems with processing (e.g. compost) still exist • compost quality is still a problem	• system considered reliable in some jurisdictions (not Ontario) • combination of several approaches to achieve waste diversion • potential for odours from composting plants can be mitigated through appropriate start-up procedures, careful monitoring and effective technology	<u>Advantages</u> • technology well-developed for Europe • potential for system breakdown is minimal and can be mitigated with public use of other diversion techniques <u>Disadvantages</u> • reliant on a primary approach to waste reduction • not proven at full scale in North America
Indicator: Degree of reliance on single approach	• Wet/Dry relies on a single approach (i.e. two or three stream collection) which also incorporates other 3R's elements • if unsuccessful, any or all aspects of the approach can be modified on a temporary or long term basis		

TABLE PR.5
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Peel

SYSTEM: Wet/Dry

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accommodated	• expands range of dry recyclable materials collected curbside and results in greater quantities collected • allows curbside collection of wet household waste	• expansion of the existing MRF would be required to enhance system flexibility and accommodate increased quantities of dry recyclables • expanded centralized composting facility (probably in-vessel) would be required	Advantages • collection of wider range and greater quantity of materials at curbside • helps divert wet household waste not captured otherwise • elements of Existing Systems maintained (eg. backyard composting) Disadvantages • fundamental changes to ways in which waste managed • expanded centralized composting facilities will be required • require operational changes for municipality and residents • will require expansion of existing MRF
Indicator: Compatibility with Existing System	• requires fundamental change in Existing System to two or three stream collection • relies on some elements of Existing Systems (eg. backyard compost and participation in leaf and yard waste collection for further diversion) • requires new municipal and household equipment		

TABLE PR.5
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Peel

SYSTEM: Wet/Dry

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Performance			
Indicator: Quantity diverted or requiring landfilling	• 56% waste diversion possible with 80% single-family and 40% other households composting plus multi-family diversion of existing Blue Box materials at 30% to 100% of Quinte capture rate, 80% of yard and food waste from single-family homes diverted through curbside and backyard composting. 30% of food waste from multi-family homes diverted. • 65% waste diversion possible with 80% of food waste from multi-family homes diverted. • 70% possible with source reduction included	• potential to increase waste diversion in compliance with provincial targets	<u>Advantage</u> • increased waste diversion to meet Ontario waste diversion targets <u>Disadvantage</u> • some assumptions on waste diversion somewhat uncertain (because it has not been proven out full scale in Ontario).

TABLE PR.6
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Peel

SYSTEM: Mixed Waste Processing (low quality compost)

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Reliability			
Indicator: Proven technologies based on experience in other jurisdictions	• successful processing is not yet widely proven	• Mixed Waste Processing system is not considered highly reliable but may be used as an add-on to an Existing/Committed system • technology not proven and system is partially dependent on a single approach	<u>Advantages</u> • potential for processing waste remaining after backyard composting and recycling of other materials <u>Disadvantages</u> • experience has shown processing may fail • not a proven successful technology
Indicator: Degree of reliance on single approach	• reliability limited by dependence on single processing facility for "third bag" waste • potentially mitigated if residents continue to source separate recyclables, organics etc. as at present		

TABLE PR.6
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Peel

SYSTEM: Mixed Waste Processing (low quality compost)

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accommodated	• increased quantity of waste processed • may decrease quantity or quality of secondary materials actually marketed or reused	• Mixed Waste Processing offers flexibility to increase range and quantity of materials accepted • high quality processing is questionable • the system is partially compatible with Existing/Committed collection systems but strongly contradicts existing waste management policy	Advantages • increase in waste diversion through mass reduction in composting process Disadvantages • contradicts existing policy • may decrease value of recyclables • regressive step erodes advances in 3Rs promotion/acceptance by public
Indicator: Compatibility with Existing System	• compatible with general approach of existing committed system • conflicts with existing policy to promote participation in source separation • production of RDF for incineration conflicts with current legislation • requires new mixed solid waste processing plant		

TABLE PR.6
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Peel

SYSTEM: Mixed Waste Processing (low quality compost)

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Performance			
Indicator: Quantity diverted or requiring landfilling	• 56% waste diversion possible with 80% single-family and 40% other households composting (assumes first 25% of hhlds divert 240 kg/hhld/yr and remainder divert 100 kg/hh/yr). Multi-family diversion of Existing Blue Box materials dry recyclables at 30% to 100% of Quinte capture rate. • 58% waste diversion possible with all backyard composters diverting 240 kg/hh/yr • 63% possible with source reduction included	• increased waste diversion	Advantage • meets Ontario waste diversion targets • a portion of waste currently disposed may be processed for diversion Disadvantages • quantity requiring landfill is unknown due to unproven technology • marketability of materials processed is uncertain

TABLE PR.6
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Peel

SYSTEM: Mixed Waste Processing (high quality compost)

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Reliability			
Indicator: Proven technologies based on experience in other jurisdictions	• successful processing is not yet widely proven	• Mixed Waste Processing system is not considered highly reliable but may be used as an add-on to an Existing/Committed system • technology not proven and system is partially dependent on a single approach	<u>Advantages</u> • potential for processing waste remaining after backyard composting and recycling of other materials <u>Disadvantages</u> • experience has shown processing may fail • not a proven successful technology
Indicator: Degree of reliance on single approach	• reliability limited by dependence on single processing facility for "third bag" waste • potentially mitigated if residents continue to source separate recyclables, organics etc. as at present		

TABLE PR.6
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Peel

SYSTEM: Mixed Waste Processing (high quality compost)

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accommodated	• increased quantity of waste processed • may decrease quantity or quality of secondary materials actually marketed or reused	• Mixed Waste Processing offers flexibility to increase range and quantity of materials accepted • high quality processing is questionable • the system is partially compatible with Existing/Committed collection systems but strongly contradicts existing waste management policy	Advantages • increase in waste diversion through mass reduction in composting process Disadvantages • contradicts existing policy • may decrease value of recyclables • regressive step erodes advances in 3Rs promotion/acceptance by public
Indicator: Compatibility with Existing System	• compatible with general approach of Existing/Committed system • conflicts with existing policy to promote participation in source separation • production of RDF for incineration conflicts with current legislation • requires new mixed solid waste processing plant		

TABLE PR.6
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: Peel

SYSTEM: Mixed Waste Processing (high quality compost)

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Performance			
Indicator: Quantity diverted or requiring landfilling	• up to 82% waste diversion possible with 80% single family and 40% other households composting 240 kg/hh/yr (including source reduction)	• increased waste diversion	Advantage • meets Ontario waste diversion targets • a portion of waste currently disposed may be processed for diversion Disadvantages • quantity requiring landfill is unknown due to unproven technology • marketability of materials processed is uncertain

SCHEDULE Q

IC&I GENERIC NET EFFECTS TABLES

TABLE 1 – IC&I SYSTEM 1
EXISTING SYSTEM
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: IC&I Existing System
CRITERIA GROUP: Service
CRITERIA: Reliability
INDICATOR: Proven Technology/Experience

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Collection – Dry Wastes • Voluntary source separation of dry recyclables by some IC&I generators. • Collection of source separated dry recyclables from the IC&I sector by private sector haulers and recyclers. • Curbside collection of IC&I recyclables in some areas by municipal forces. • IC&I depots at transfer stations for use by small business generators • Landfill bans on specified materials (e.g. wood, tires, drywall, scrap metal, white goods, fine paper etc.).	• proven technology, • diverts waste from landfill for recycling and reuse • not all generators source separate • landfill bans have a positive effect on diversion, but may lead to dumping and export	• increase education/promotion to encourage increased voluntary participation in source separation, source reduction, recycling and reuse • strong markets for secondary materials will improve economics of recycling and increase diversion	• proven technology contributing to waste diversion
IC&I Collection – Wet Wastes • Voluntary source separation of IC&I wet wastes. • Separate collection of IC&I wet wastes	• proven technology, • not all generators source separate • much of IC&I wet wastes currently are sent to disposal	• increase education/promotion to view wet wastes as resource • increase promotion/education to encourage redistribution of food waste as human or animal food • encourage effective separation of wet organics to enhance composting and other uses	• proven technology contributing to waste diversion

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
<u>IC&I Processing - Dry Wastes</u> • Processing of specific dry materials (e.g. C&D wastes, wood, drywall etc.) in specially designed facilities • Processing centres for a wide range of dry recyclables collected from the IC&I sector, owned by the private sector and operated by private sector staff • Processing of IC&I sector recyclables in municipal MRF's • Processing of IC&I sector recyclables in small private sector recyclers	• proven technology but undergoing improvements • some operational problems, mechanical components may break down • some noise/dust • subject to build-up of material inventories or, not diverting particular materials due to lack of markets • operators tend to concentrate on most easily separated materials	• develop/stabilize markets • site away from residential areas • careful management of operations	• proven technology contributing to removal of materials from waste stream for reprocessing and reuse
<u>IC&I Processing - Wet Wastes</u> • Centralized windrow composting of source-separated IC&I organics (e.g. Scotts Farm) • On-site composting of source separated organics generated by the IC&I sector • Centralized composting of IC&I organics in in-vessel system • Vermicomposting at some IC&I locations • Rendering of food wastes from IC&I sector	• composting is proven technology but some operational problems - odour problems can be problematic - finished compost quality can be inconsistent • not all IC&I wet wastes streams are compostable due to contaminants • achieves significant, 50%, mass reduction • up to 80% volume reduction for leaf wastes	• encourage effective source separation of wet organics - promotion/education and incentives required • careful management of composting process • site away from residential areas	• proven technology - significant mass/volume reduction • greatest benefit when finished compost marketable • composting sites experience some operational problems (odours)

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Reuse			
• Reuse by IC&I generators, through the Canadian, Provincial (e.g. Ontario Waste Exchange) and local waste exchange programs (e.g. Durham). • Community-based reuse programs for small IC&I generators (WASTEWISE, Halton). • Use of food wastes as animal feed. • Use of food waste for human consumption. • Landspreading of IC&I organics • Refilling of IC&I containers and packaging refillable bottles refillable pails or drums. • Use of re-usable packaging (e.g. reusable plastic and wood pallets).	• proven technology • popular with industry-particularly demolition sector which has been practising for many years • cost savings realized • more preferred than recycling (second R in hierarchy)	• extend education/promotion of potential for reuse • support re-use activities	• proven technology – diversion from landfill – reuse offers optimum cost savings
IC&I Reduction			
• Voluntary waste reduction actions by IC&I generators. • Voluntary reduction of packaging waste by 25% by the year 2000 (NAPP).	• source reduction most preferred of 3Rs • proven technology • positive effect on waste reduction - but cannot depend on innovation by all generators • source reduction proven to save money in many cases	• encourage through increased education/promotion • support research for innovation	• proven technology - diversion from landfill and cost savings realized

IC&I Existing System, Reliability (cont'd)

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Programs • Voluntary waste audits performed by IC&I generators • Independent voluntary waste reduction programs in private companies • Voluntary packaging reporting by packaging users (NAPP)	• proven technology but cannot rely on generators to voluntarily implement programs • results in waste reduction and waste diversion, and provides cost savings • facility staff generally supportive	• encourage through promotion and education • provide technical and advisory support to waste generators • involve facility staff, create incentives	• proven technology - waste diversion and waste reduction from which cost savings also realized
IC&I Promotion & Education • IC&I information hotline (Metro) • Promotion/education program focused on reducing waste disposed by the IC&I sector, carried out by the regional municipality • Promotion/education of IC&I waste reduction by non-profit organizations (e.g. RCO) • Promotion/education of IC&I waste reduction by associations	• proven technology • essential component of 3Rs programs • enhances virtually all components of 3Rs waste management system • contributes to increased voluntary participation	• identify opportunities for education/promotion • maintain, extend and improve programs	• proven technology • increases awareness of opportunities and responsibilities for waste diversion and reduction

TABLE 1 – IC&I SYSTEM 1
EXISTING SYSTEM
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: IC&I Existing System
CRITERIA GROUP: Service
CRITERIA: Flexibility
INDICATOR: Types and Range of Quantities of Waste Accepted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Collection – Dry Wastes • Voluntary source separation of dry recyclables by some IC&I generators. • Collection of source separated dry recyclables from the IC&I sector by private sector haulers and recyclers. • Curbside collection of IC&I recyclables in some areas by municipal forces. • IC&I depots at transfer stations for use by small business generators • Landfill bans on specified materials (e.g. wood, tires, drywall, scrap metal, white goods, fine paper etc.).	• technology available to handle range of IC&I dry wastes • haulers and operators respond to different waste materials • which materials are collected is affected by markets and by legislation such as landfill bans • currently the strongest markets have led to voluntary separation of OCC, office paper, scrap metals, clean wood and PET • quantity collected is related to market demand - increased markets can stimulate increased voluntary source-separation and collection • quantity of waste available/handled affects revenues of operators/haulers - in some cases only the largest generators of a particular material or set of materials are serviced due to market availability and economics • quantity of a material collected is related to processing capacity • quantity and type material collected depend on willingness to source separate • quantity and type of materials collected affect specification and requirements for processing facilities • private sector will generally respond to provide service if opportunity and demand exists	• maintain/expand existing range and quantity of materials collected by: – increased promotion/education – support to market development – prudent application of landfill bans	• technology flexible in terms of range and quantity of materials accepted • positive affect on diversion by increasing range and quantity of materials collected • markets for processed wastes are the most significant factor leading to increased collection and diversion

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
<u>IC&I Collection - Wet Wastes</u> • Voluntary source separation of IC&I wet wastes. • Separate collection of IC&I wet wastes	• technology exists to handle effectively clean wet organics, while mixed wet wastes most often are landfilled • currently a relatively small amount of food waste is being effectively separated and collected - mostly in institutional and food service sectors • higher degree/quality of source separation of contaminants from wet organics increases potential to compost, use in land spreading and use as animal feed, and thus increases diversion • quantity diverted is affected by market demand, and by willingness to source separate • quantity and extent of separation affect specification and requirements for processing facilities • source separation of wet wastes can improve diversion of dry wastes (by minimizing contamination)	• promotion/education concerning source separation of wet wastes • encourage effective source separation of wet organics to ensure marketability	• technology is flexible, capacity can be increased • increasing source separation of wet waste has positive effect on potential diversion dry wastes • increasing separation of organics has a positive affect on waste diversion

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Processing – Dry Wastes • Processing of specific dry materials (e.g. C&D wastes, wood, drywall etc.) in specially designed facilities • Processing centres for a wide range of dry recyclables collected from the IC&I sector, owned by the private sector and operated by private sector staff • Processing of IC&I sector recyclables in municipal MRF's. • Processing of IC&I sector recyclables by small private sector recyclers	• market demand has positive effect on range of materials diverted • market availability can stimulate increased voluntary source separation and collection, and can have a positive affect on diversion • may require increase in investment in processing capacity, and processing equipment to match quantity and range of materials • willingness to source separate, particularly wet/dry, positively affects processing potential • processing capacity flexible (can be increased) if markets available • MRF's can increase capacity by working 2 or 3 shifts, 7 days per week • limited flexibility in ability to process mixed plastics economically	• maintain/expand existing range and quantity of materials processed by: – increased promotion/education – support for market development	• capacity is flexible • potential exists to increase range and quantity of materials processed with positive effect on waste diversion
IC&I Processing – Wet Wastes • Centralized windrow composting of source-separated IC&I organics (e.g. Scotts Farm). • On-site composting of source separated organics generated by the IC&I sector. • Centralized composting of IC&I organics in in-vessel system. • Vermicomposting at some IC&I locations. • Rendering of food wastes from IC&I sector.	• rendering capacity can be increased • composting capacity limited, but a number of proposed facilities would provide increased capacity • food and yard wastes are effectively handled • increased quality/extent of source separation of wet organic wastes increases potential to process into marketable product either for direct land application, animal food or composting	• increase promotion/education of advantages of source separation of wet wastes and development of markets • provide more opportunities for productive use of finished compost	• technology is flexible - potential to increase quantity of wet wastes diverted depends on market demand and quality of product • capacity is somewhat flexible, to handle increased quantities

Component Category Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Reuse • Reuse by IC&I generators through the Canadian, Provincial (e.g. Ontario Waste Exchange) and local waste exchange programs (e.g. Durham) • Community-based reuse programs for small IC&I generators (WASTEWISE - Halton) • Use of food wastes as animal feed • Use of food waste for human consumption • of IC&I organics • Refilling of IC&I containers and packaging: refillable bottles refillable pails or drums • Use of reusable packaging (e.g. reusable plastic and wood pallets)	• wide range of materials accepted for reuse • potential to adjust to demand and innovation • extends range/quantity of materials diverted as can handle difficult-to-recycle/non-recyclable goods • cost savings serve as incentive to explore 3Rs initiatives • innovation for reusable packaging can have a positive effect on diversion	• increase promotion/education of reuse option • support innovation for reusable products/equipment and packaging	• approach is flexible, can be applied to a number of different products/packages/wastes • increasing range and quantity of materials reused has positive effect on waste diversion with lower costs
IC&I Reduction • Voluntary waste reduction actions by IC&I generators • Voluntary reduction of packaging waste by 25% by the year 2000 (NAPP)	• innovation toward reduction can pertain to wide range and quantity of materials • innovation will depend in part on economic and legislative factors	• increase education/promotion of reduction • support research for innovation	• increasing range of materials covered in waste reduction efforts has positive affect on waste diversion and can achieve cost savings

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Programs • Voluntary waste audits performed by IC&I generators. • Independent voluntary waste reduction programs in private companies. • Voluntary packaging reporting by packaging users (NAPP)	• programs can be directed toward a wide range and quantity of materials • programs are established on a voluntary basis	• continue education/promotion of 3Rs, and benefits of audits/WRAP's • facilitate and provide technical support to establish programs • continue to develop markets and incentives	• positive effect on range and quantity of materials reduced, reused and recycled
IC&I Promotion & Education • IC&I information hotline (Metro). • Promotion/education program focused on reducing waste disposed by the IC&I sector, carried out by the regional municipality. • Promotion/education of IC&I waste reduction by non-profit organizations (e.g. RCO) • Promotion/education of IC&I waste reduction by associations	• promotion and education can focus on wide range and quantity of materials	• continue to provide education/promotion services focusing on a wide range and quantity of materials	• education/promotion can increase the range and quantity of materials diverted

Schedule Q-1
TABLE 1 - IC&I SYSTEM 1
EXISTING SYSTEM
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: IC&I Existing System
CRITERIA GROUP: Service
CRITERIA: Performance
INDICATOR: Quantity Diverted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Collection – Dry Wastes • Voluntary source separation of dry recyclables by some IC&I generators • Collection of source separated dry recyclables from the IC&I sector by private sector haulers and recyclers • Curbside collection of IC&I recyclables in some areas by municipal forces • IC&I depots at transfer stations for use by small business generators • Landfill bans on specified materials (e.g. wood, tires, drywall, scrap metal, white goods, fine paper etc.)	• Source separation and collection of dry wastes required for diversion • voluntary source separation of dry recyclables results in diversion from landfill • not all generators voluntarily participate in source separation • landfill bans can result in appropriate diversion of specific materials but can also cause dumping and higher costs to generators • current voluntary efforts estimated to divert 25% to 32% waste from disposal	• continue promotion/education regarding source separation for 3Rs • support development of markets • maintain/extend prudent implementation of landfill bans	• Source separation and collection of dry wastes required for diversion • existing landfill bans in most areas have positive affect on waste diversion
IC&I Collection – Wet Wastes • Voluntary source separation of IC&I wet wastes • Separate collection of IC&I wet wastes	• Voluntary source separation of wet wastes results in diversion from landfill • positive affect on wet organics and on dry recyclables • source separating contaminants from wet organics has positive affect on marketability and diversion • not all generators voluntarily participate in source separation • current diversion of wet organics is relatively low	• continue promotion/education regarding source separation of wet wastes • encourage improved source separation of materials limiting marketability of wet organic waste products	• source separation and collection of wet waste has a positive effect on diversion particularly if there is effective separation of clean organics

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
<u>IC&I Processing – Dry Wastes</u> • Processing of specific dry materials (e.g. C&D wastes, wood, drywall etc.) in specially designed facilities • Processing centres for a wide range of dry recyclables collected from the IC&I sector, owned by the private sector and operated by private sector staff • Processing of IC&I sector recyclables in municipal MRF's. • Processing of IC&I sector recyclables by small private sector recyclers	• processing of dry wastes is a necessary element, and has a positive affect on diversion of dry recyclables • currently processing an estimated 25% to 32% dry materials • diversion depends on markets for products: potentially useful materials can be left in disposed stream when market not strong • diversion at processing stage depends on contamination of dry recyclables	• continue/extend promotion of source separation • development of markets for dry waste materials	• processing is a necessary element of waste diversion system and has a positive effect on waste diversion
<u>IC&I Processing – Wet Wastes</u> • Centralized windrow composting of source-separated IC&I organics (e.g. Scotts Farm). • On-site composting of source separated organics generated by the IC&I sector. • Centralized composting of IC&I organics in in-vessel system. • Vermicomposting at some IC&I locations. • Rendering of food wastes from IC&I sector.	• positive affect through – mass reduction up to 50% for clean organics through composting – marketable product for clean organics through composting – marketable end product through rendering	• promotion/education regarding source separation and separate management of wet wastes	• positive effect on waste reduction and waste diversion

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
<u>IC&I Reuse</u> • Reuse by IC&I generators through the Canadian, Provincial (e.g. Ontario Waste Exchange) and local waste exchange programs (e.g. Durham) • Community-based reuse programs for small IC&I generators (WASTE WISE - Halton) • Use of food wastes as animal feed • Use of food waste for human consumption • of IC&I organics • Refilling of IC&I containers and packaging: refillable bottles, refillable pails or drums • Use of re-usable packaging (e.g. reusable plastic and wood pallets)	• positive effect on diversion through reuse of items and materials • difficult to quantify all reuse effects (e.g. garage sales, informal swaps, etc.) • 1992 - 56,000 tonnes waste handled by Ontario Waste Exchange	• increase promotion of potential for reuse of wastes • support innovation for reusable items	• potential for increased waste reduction and diversion and reduced waste disposal
<u>IC&I Reduction</u> • Voluntary waste reduction actions by IC&I generators • Voluntary reduction of packaging waste by 25% by the year 2000 (NAPP)	• positive effect on diversion through waste reduction • difficult to quantify waste reduction effect. On-going assessment of programs toward NAPP goals	• promotion of potential for waste reduction • facilitate organization efforts for waste reduction • support for innovation for waste reduction	• reduction valuable contribution to waste diversion • difficult to quantify

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
<u>IC&I Programs</u> • Voluntary waste audits performed by IC&I generators. • Independent voluntary waste reduction programs in private companies. • Mandatory waste audits by major IC&I generators (3Rs regulations). • Voluntary packaging reporting by packaging users (NAPP)	• potentially positive effect on diversion through increased awareness of opportunities for waste reduction/diversion • difficult to quantify waste reduction and diversion resulting from specific programs at this point • secondary positive effect of employee awareness of waste stream	• promotion/education regarding potential of 3Rs programs • on-going assessment of programs toward NAPP goals	• potential positive effect on waste diversion and waste reduction
<u>IC&I Promotion & Education</u> • IC&I information hotline (Metro). • Promotion/education program focused on reducing waste disposed by the IC&I sector, carried out by the regional municipality. • Promotion/education of IC&I waste reduction by non-profit organizations (e.g. RCO) • Promotion/education of IC&I waste reduction by associations	• difficult to quantify effect of promotion/education on waste diversion • generally believed to have positive effects on most 3R components of waste management systems	• maintain/extend existing promotion/education as appropriate	• positive effect on waste diversion and reduction

TABLE 1 – IC&I SYSTEM 2
EXISTING/COMMITTED SYSTEM
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: IC&I Existing / Committed System
CRITERIA GROUP: Service
CRITERIA: Reliability
INDICATOR: Proven Technology

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Collection – Dry Wastes • Voluntary source separation of dry recyclables by some IC&I generators. • Mandatory source separation of designated materials by major generators (3Rs regulations). • Collection of source separated dry recyclables from the IC&I sector by private sector haulers and recyclers. • Curbside collection of IC&I recyclables in some areas by municipal forces. • IC&I depots at transfer stations for use by small business generators. • Landfill bans on specified materials (e.g. wood, tires, drywall, scrap metal, white goods, fine paper etc.).	• 3Rs regulations proven approach in Rhode Island • increases number of establishments practising source separation and diverts waste from landfill for recycling and reuse • many major waste generators may not be subject to mandatory regulations • not all waste generators voluntarily source separate wastes • landfill bans have a positive effect on diversion but may lead to dumping and export • overall diversion impact low (Rhode Island) when only major IC&I generators subject to the regulations	• increase education/promotion/ monitoring to ensure major waste generators comply with regulations • education/promotion for voluntary source separation by establishments not subject to regulation • education/promotion for voluntary source separation of additional materials • some form of monitoring/follow-up may be required to ensure source separation	• proven technology with positive effect on waste diversion

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Collection – Wet Wastes • Voluntary source separation of IC&I generated organics • Separate collection of IC&I wet wastes	• separation of wet wastes carried out on voluntary basis • proven technology, but not all generators source separate • much of IC&I wet wastes currently are sent to disposal • increased source separation of dry wastes may have positive effect on source separation of wet organics	• increase education/promotion • encourage effective separation of wet organics to enhance composting and other uses	• proven technology contributing to waste diversion

IC&I Processing – Dry Wastes
• Processing of specific dry materials (e.g. C&D wastes, wood, drywall) in specially designed facilities
• Processing centres for a wide range of dry recyclables collected from the IC&I sector, owned by the private sector and operated by private sector staff
• Processing of IC&I sector recyclables in municipal MRFs
• Processing of IC&I sector recyclables by small private sector recyclers
	• may need some increased capacity to handle increase of source separated materials from mandatory source separation legislation
	• proven technology, but undergoing improvements
	• some operational problems
	  - mechanical components may breakdown
	  - some noise/dust
	  - plastics sorting technologies not well developed
	• subject to stockpiling or landfilling recoverable materials depending on market conditions
	• operators tend to concentrate on most easily separated materials for which markets are stable/readily available
		• ensure processing facilities can handle waste materials collected for processing
		• develop/stabilize markets
		• site away from residential areas
		• careful management of operation
		• continue to improve technology, particularly for plastics
			• proven technology for most materials contributing to diversion of materials from disposal for reprocessing and reuse

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Processing – Wet Wastes • Centralized windrow composting of source-separated IC&I organics (e.g. Scotts Farm). • On-site composting of source separated organics generated by the IC&I sector. • Centralized composting of IC&I organics in in-vessel system. • Vermicomposting at some IC&I locations. • Rendering of food wastes from IC&I sector.	• proven technology • some operational problems – odour problems can be problematic – product quality can be inconsistent • not all IC&I wet wastes are compostable due to contaminant materials • achieves significant, 50% mass reduction through composting • up to 80% volume reduction for leaf wastes through composting	• encourage effective source separation of wet organics – promotion/education and incentives required • careful management of composting process • site away from residential areas	• composting is proven technology-significant mass/volume reduction provides for waste reduction • greatest benefit when compost product marketable • rendering produces valuable end product, but process is energy intensive and expensive
IC&I Reuse • Reuse by IC&I generators, through the Canadian, Provincial (e.g. Ontario Waste Exchange) and local waste exchange programs (e.g. Durham). • Community-based reuse programs for small IC&I generators (WASTEWISE, Halton). • Use of food wastes as animal feed. • Use of food waste for human consumption. • Landspreading of IC&I organics • Use of refillable containers (refillable bottles, refillable pails or drums, etc.). • Use of re-usable packaging (e.g. reusable plastic and wood pallets).	• no additional effect noted	• none required	• no additional effect noted

Component Category Components	Component Effects	Mitigation Enhancement	Component Net Effects
IC&I Reduction • Voluntary waste reduction actions by IC&I generators • Voluntary reduction of packaging waste by 50% by the year 2000 (NAPP) • Mandatory development of waste reduction action plans by major IC&I generators (defined in 3Rs regulations) • Mandatory development of packaging reduction action plans by major packaging generators (defined in 3Rs regulations)	• regulated waste audit approach proven in Rhode Island • diversion potential limited if only major generators included • proven technology – positive effect on waste reduction • positive effect on identifying opportunities for waste reduction • requires commitment from waste generators for follow-up on audits and plans • requires monitoring/follow-up to ensure progress toward implementation of action plans	• promotion/education of 3Rs potential • provide monitoring/technical support for implementation of plans • support research toward innovative measures	• proven technology positive effect on reduction of waste disposed
IC&I Programs • Voluntary waste audits performed by IC&I generators • Independent voluntary waste reduction programs in private companies • Mandatory waste audits by major IC&I generators (3Rs regulations) • Mandatory packaging audits by major packaging generators (3Rs regulations) • Voluntary packaging reporting by packaging users (NAPP)	• proven technology • effective in identifying opportunities for waste reduction and diversion • requires commitment from waste generators for follow-up on audits and plans • requires monitoring/follow-up to ensure progress toward implementation of plans	• promotion/education of 3Rs potential • provide monitoring/technical support for implementation of plans	• proven technology with positive effect on waste reduction and diversion from landfill

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
<u>IC&I Promotion & Education</u> • IC&I information hotline (Metro). • Promotion/education program focused on reducing waste disposed by the IC&I sector, carried out by the regional municipality. • Promotion/education of IC&I waste reduction by non-profit organizations (e.g. RCO) • Promotion/education of IC&I waste reduction by associations • Mandatory posting of waste reduction plans for review by employees by major IC&I generators (3Rs regulations).	• proven technology • essential component of 3Rs programs • enhances virtually all components of 3Rs waste management systems • opportunity for employees to participate in waste management	• continue to identify opportunities for education/promotion • support education/promotion activities of waste generators • develop promotion/education program on 3Rs regulations	• proven technology • increase awareness of opportunities and responsibilities for waste diversion and reduction

Schedule Q-2

TABLE 1 - IC&I SYSTEM 2

EXISTING/COMMITTED SYSTEM

GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: IC&I Existing / Committed System

CRITERIA GROUP: Service

CRITERIA: Flexibility

INDICATOR: Types and Range of Quantities of Waste Accepted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Collection - Dry Wastes • Voluntary source separation of dry recyclables by some IC&I generators • Mandatory source separation of designated materials by major generators (3Rs regulations) • Collection of source separated dry recyclables from the IC&I sector by private sector haulers and recyclers • Curbside collection of IC&I recyclables in some areas by municipal forces • IC&I depots at transfer stations for use by small business generators • Landfill bans on specified materials (e.g. wood, tires, drywall, scrap metal, white goods, fine paper etc.)	• positive effect on diversion as range of materials source separated by many establishments increases due to legislation • positive effect on diversion as quantity of materials increases under legislation • may require additional collection and processing capacity. Stockpiling may occur in interim • materials currently subject to regulations have strongest markets (OCC, glass, metal, fine paper, PET, and to some extent, HDPE) • increase in quantity collected may require further market development to realize diversion • contamination of dry wastes reduces marketability	• support market development for source-separated materials	• positive effect on waste diversion as range and quantity of materials source separated increases

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Collection – Wet Wastes • Voluntary source separation of IC&I generated organics. • Separate collection of IC&I wet wastes	• increased source separation of dry wastes may have positive spin off on source separation of wet wastes • quality/degrees of separation of wet wastes affects marketability • committed policy does not address wet wastes generated by IC&I sector	• promotion/education concerning enhancing diversion through effective source separation of wet wastes	• possible positive effect on waste diversion
IC&I Processing – Dry Wastes • Processing of specific dry materials (e.g. C&D wastes, wood, drywall) in specially designed facilities. • Processing centres for a wide range of dry recyclables collected from the IC&I sector, owned by the private sector and operated by private sector staff • Processing of IC&I sector recyclables in municipal MRF's. • Processing of IC&I sector recyclables by small private sector recyclers	• expansion of processing capacity may be required, resulting in increased diversion • range of materials accepted by processing facilities may change • stockpiling, export and disposal of recyclables may increase depending on markets • materials subject to committed 3Rs regulations have strongest markets and are most easily recycled	• support development of markets for waste materials • support innovation in processing and reprocessing to create markets	• increasing range and quantity of dry recyclables processed and marketed increases waste diversion

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Processing – Wet Wastes • Centralized windrow composting of source-separated IC&I organics (e.g. Scott's Farm) • On-site composting of source separated organics generated by the IC&I sector • Centralized composting of IC&I organics in in-vessel system • Vermicomposting at some IC&I locations • Rendering of food wastes from IC&I sector	• possible increase in wet wastes separated for processing due to increased separation of dry wastes • increased quality of organics waste and finished compost increases marketability • committed policy does not require separate management by IC&I sector	• continue promotion/education to encourage effective source separation of wet organics to ensure marketability	• possible increase in separation of wet wastes can lead to increased waste diversion
IC&I Reuse • Reuse by IC&I generators through the Canadian, Provincial (e.g. Ontario Waste Exchange) and local waste exchange programs (e.g. Durham) • Community-based reuse programs for small IC&I generators (WASTEWISE - Halton) • Use of food wastes as animal feed • Use of food waste for human consumption • Landspreading of IC&I organics • Use of refillable containers (refillable bottles, refillable pails or drums, etc.) • Use of re-usable packaging (e.g. reusable plastic and wood pallets)	• packaging and waste audits and waste reduction plans may stimulate reuse initiatives • reuse preferred to recycling where feasible	• promotion/education to ensure that IC&I sector are aware of this option	• possible positive effect from packaging and waste audits and waste reduction plans

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
<u>IC&I Reduction</u> • Voluntary waste reduction actions by IC&I generators. • Voluntary reduction of packaging waste by 25% by the year 2000 (NAPP). • Mandatory development of waste reduction action plans by major IC&I generators (defined in 3Rs regulations). • Mandatory development of packaging reduction action plans by major packaging generators (defined in 3Rs regulations).	• possible increased innovation both regarding waste produced and use of recyclable materials • reduction must be quantified in packaging audits - causes increased awareness for manufacturers	• education/promotion of reduction • support production/implementation of action plans • support research	• potential positive effect on waste reduction and use of recyclable materials
<u>IC&I Programs</u> • Voluntary waste audits performed by IC&I generators. • Independent voluntary waste reduction programs in private companies. • Mandatory waste audits by major IC&I generators (3Rs regulations). • Mandatory packaging audits by major packaging generators (3Rs regulations). • Voluntary packaging reporting by packaging users (NAPP).	• through waste audits and packaging audits opportunities can be identified for waste reduction or recycling • quantity and range of materials diverted from disposal may increase • increasing range and size of markets for materials will increase opportunities	• continue education/promotion of 3Rs • further develop/stabilize markets for waste materials - can use audit information to better define quantity of materials	• positive effect on range/quantity of materials recycled

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Promotion & Education • IC&I information hotline (Metro) • Promotion/education program focused on reducing waste disposed by the IC&I sector, carried out by the regional municipality • Promotion/education of IC&I waste reduction by non-profit organizations (e.g. RCO) • Promotion/education of IC&I waste reduction by associations • Mandatory posting of waste reduction plans for review by employees by major IC&I generators (3Rs regulations)	• facilitating review by employees of waste reduction plans can lead to more effective source separation, greater possibility for innovation	• none required	• possible positive effect on range and quantity of materials diverted

TABLE 1 – IC&I SYSTEM 2
EXISTING/COMMITTED SYSTEM
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: IC&I Existing / Committed System
CRITERIA GROUP: Service
CRITERIA: Performance
INDICATOR: Quantity Diverted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
<u>IC&I Collection – Dry Wastes</u> • Voluntary source separation of dry recyclables by some IC&I generators. • Mandatory source separation of designated materials by major generators (3Rs regulations). • Collection of source separated dry recyclables from the IC&I sector by private sector haulers and recyclers. • Curbside collection of IC&I recyclables in some areas by municipal forces. • IC&I depots at transfer stations for use by small business generators. • Landfill bans on specified materials (e.g. wood, tires, drywall, scrap metal, white goods, fine paper etc.).	• depending on the extent of inclusion of establishments in the proposed 3R regulations, a greater quantity of materials will be source separated and collected • if 20% of the material in sectors subject to the regulations is assumed to be captured by the regulations, the diversion is estimated to be 33% of waste • if 60% of those materials are assumed to be captured the diversion is estimated to be 46% of waste • high tipping fees and weak markets may result in some waste materials collected being exported • the degree of overlap between current voluntary efforts and Existing/Committed mandatory requirements	• continue promotion/education regarding source separation for 3Rs • support development of markets • maintain/extend prudent implementation of landfill bans	• the mandatory source separation has positive effect increasing source separation and collection of recyclables for processing and diversion

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Collection – Wet Wastes • Voluntary source separation of IC&I generated organics • Separate collection of IC&I wet wastes	• Existing/Committed system does not require any mandatory source separation of organics • mandatory separation of dry wastes may result in increased source separation of wet wastes • current diversion of wet organics is relatively low • all organics source separation efforts are voluntary	• continue promotion/education regarding source separation of wet wastes • encourage improved source separation of materials limiting marketability of wet organic waste products	• source separation and collection of wet wastes has a positive effect on diversion, particularly if effective separation of clean organics
IC&I Processing – Dry Wastes • Processing of specific dry materials (e.g. C&D wastes, wood, drywall) in specially designed facilities • Processing centres for a wide range of dry recyclables collected from the IC&I sector, owned by the private sector and operated by private sector staff • Processing of IC&I sector recyclables in municipal MRFs • Processing of IC&I sector recyclables by small private sector recyclers	• processing of additional material separated and collected has a positive effect on diversion • processing capacity is likely sufficient to handle the increased collection of source separated waste, from 33% to 46%	• none required	• positive effect on diversion by processing additional materials

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Processing – Wet Wastes • Centralized windrow composting of source-separated IC&I organics (e.g. Scotts Farm). • On-site composting of source separated organics generated by the IC&I sector. • Centralized composting of IC&I organics in in-vessel system. • Vermicomposting at some IC&I locations. • Rendering of food wastes from IC&I sector.	• no additional effect noted • may achieve (spin-off) increase in processing of wet organics but not quantifiable	• none required	• no additional effect noted
IC&I Reuse • Reuse by IC&I generators, through the Canadian, Provincial (e.g. Ontario Waste Exchange) and local waste exchange programs (e.g. Durham). • Community-based reuse programs for small IC&I generators (WASTEWISE, Halton). • Use of food wastes as animal feed. • Use of food waste for human consumption. • Landspreading of IC&I organics • Use of refillable containers (refillable bottles, refillable pails or drums, etc.). • Use of re-usable packaging (e.g. reusable plastic and wood pallets).	• no additional effect noted	• none required	• no additional effect noted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Reduction • Voluntary waste reduction actions by IC&I generators • Voluntary reduction of packaging waste by 25% by the year 2000 (NAPP) • Mandatory development of waste reduction action plans by major IC&I generators (defined in 3Rs regulations) • Mandatory development of packaging reduction action plans by major packaging generators (defined in 3Rs regulations)	• positive effect on diversion resulting from waste and packaging reduction plans difficult to quantity	• some form of monitoring and follow-up to provide feedback and inform policy and market development • on-going assessment of program toward NAPP goals	• net positive effect on waste diversion difficult to quantify
IC&I Programs • Voluntary waste audits performed by IC&I generators • Independent voluntary waste reduction programs in private companies • Mandatory waste audits by major IC&I generators (3Rs regulations) • Mandatory packaging audits by major packaging generators (3Rs regulations) • Voluntary packaging reporting by packaging users (NAPP)	• potentially positive effect on diversion through increased awareness of opportunities for waste reduction/diversion	• promotion/education regarding potential of 3Rs programs • some form of follow-up to quantify to inform policy and market development • on-going assessment of program toward NAPP goals	• net positive effect on waste diversion difficult to quantify

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Promotion & Education • IC&I information hotline (Metro). • Promotion/education program focused on reducing waste disposed by the IC&I sector, carried out by the regional municipality. • Promotion/education of IC&I waste reduction by non-profit organizations (e.g. RCO) • Promotion/education of IC&I waste reduction by associations • Mandatory posting of waste reduction plans for review by employees by major IC&I generators (3Rs regulations).	• difficult to quantify effect of promotion/education on waste diversion • generally believed to have positive effects on most 3R components of waste management system	• maintain/extend existing promotion/education as appropriate	• potential positive effect on waste diversion and reduction

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TABLE 1 – IC&I SYSTEM 3
EXTENDED 3Rs REGULATIONS
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: IC&I Extended 3Rs System
CRITERIA GROUP: Service
CRITERIA: Reliability
INDICATOR: Proven Technology

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Collection – Dry Wastes • Mandatory source separation of designated materials by most IC&I generators in GTA (to capture 90% of total IC&I waste generation). • Voluntary source separation of dry recyclables by small IC&I generators. • Collection of source separated dry recyclables from the IC&I sector by private sector haulers and recyclers. • Curbside collection of IC&I recyclables in some areas by municipal forces. • IC&I depots at transfer stations for use by small business generators • Landfill bans on specified materials (e.g. wood, tires, drywall, scrap metal, white goods, fine paper etc.).	• proven technology - some limitations on collection and separation of plastics - low density/high volume, complications in processing mixed plastics • increase in number of IC&I generators that will be required to source separate • regulations aiming for 90% capture of IC&I waste materials not proven • not all waste generators subject to regulation will want to source separate wastes • success depends on effective design of regulations to identify and regulate establishments which generate most (90%) of IC&I waste (note: in this system 90% of most types of plastics and wood waste generated by the manufacturing, wholesale and retail sectors has been targeted) • success depends on effective identification of materials for separation, particularly important in manufacturing, retail and wholesale sectors which are subject to separating an expanded list of materials	• increase education/promotion/ monitoring to ensure waste generators complying with regulations • education/promotion to encourage voluntary source separation of additional materials by generators not subject to the regulations • effective monitoring and follow-up required to ensure compliance and effective source separation	• proven technology for most materials with positive effect on waste diversion

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Collection – Wet Wastes • Voluntary source separation of IC&I generated organics • Separate collection of IC&I wet wastes	• proven technology • some generators are reluctant to source separate and store wet wastes	• increase education/promotion to encourage effective separation of wet organics to enhance composting and other uses	• proven technology contributing to waste diversion
IC&I Processing – Dry Wastes • Additional processing capacity for dry recyclables required • Processing of specific dry materials (e.g. C&D wastes, wood, drywall) in specially designed facilities • Processing centres for a wide range of dry recyclables collected from the IC&I sector, owned by the private sector and operated by private sector staff • Processing of IC&I sector recyclables in municipal MRFs • Processing of IC&I sector recyclables by small private sector recyclers	• proven technology for source separated materials • technical limits for some waste streams and materials (e.g. construction & demolition wastes, mixed plastics etc.) • few operational problems • some noise/dust and other siting related issues • subject to stockpiling of particular materials depending on market conditions • possible disposal of a percentage of contaminated recyclables • range of materials collected and processed by private sector will depend on availability of markets - markets for some materials included for extensive source separation not well-developed (e.g. some plastics and glass) • reprocessing capacity may not exist locally (eg. polycoat containers) so active market identification required	• develop/stabilize markets - particularly plastics • site away from residential areas • enforcement of private sector processing facilities to ensure compliance with Certificates of Approval • continue to improve processing technology, particularly for plastics • continue to develop strong, stable end markets for all materials • expand potential end uses (e.g. glassphalt) for some materials	• proven technology contributing to diversion of materials from disposal for reprocessing and reuse

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
<u>IC&I Processing – Wet Wastes</u> • Centralized windrow composting of source-separated IC&I organics (e.g. Scotts Farm). • On-site composting of source separated organics generated by the IC&I sector. • Centralized composting of IC&I organics in in-vessel system. • Vermicomposting at some IC&I locations. • Rendering of food wastes from IC&I sector.	• proven technology • composting facilities have some operational problems – odour problems can be problematic – product quality can be inconsistent • not all IC&I wet wastes are compostable or suitable for other uses due to contaminant materials - effective source separation of organics required	• encourage use as human or animal feed • encourage effective source separation of wet organics – promotion/education and incentives required • careful management of composting process • site away from residential areas	• composting is proven technology- significant mass/volume reduction provides waste reduction • greatest benefit when finished compost marketable
<u>IC&I Reuse</u> • Reuse by IC&I generators, through the Canadian, Provincial (e.g. Ontario Waste Exchange) and local waste exchange programs (e.g. Durham). • Community-based reuse programs for small IC&I generators (WASTEWISE, Halton). • Use of food wastes as animal feed. • Use of food waste for human consumption. • Landspreading of IC&I organics • Use of refillable containers (refillable bottles, refillable pails or drums). • Use of re-usable packaging (e.g. reusable plastic and wood pallets).	• no additional effect noted	• no additional requirements	• no additional effect noted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Reduction • Voluntary waste reduction actions by IC&I generators • Voluntary reduction of packaging waste by 25% by the year 2000 (NAPP) • Mandatory development of waste reduction action plans by most IC&I generators (revision to 3Rs regulations) • Mandatory development of packaging reduction action plans by major packaging generators (defined in 3Rs regulations)	• no additional effect noted	• no additional requirements	• no additional effect noted
IC&I Programs • Voluntary waste audits performed by small IC&I generators • Independent voluntary waste reduction programs in private companies • Mandatory waste audits by most IC&I generators (revision to 3Rs regulations) • Mandatory packaging audits by major packaging generators (3Rs regulations) • Voluntary packaging reporting by packaging users (NAPP)	• no additional effect noted	• no additional requirements	• no additional effect noted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
<u>IC&I Promotion & Education</u> • IC&I information hotline (Metro). • Promotion/education program focused on reducing waste disposed by the IC&I sector, carried out by the regional municipality. • Promotion/education of IC&I waste reduction by non-profit organizations (e.g. RCO) • Promotion/education of IC&I waste reduction by associations • Mandatory posting of waste reduction plans for review by employees by most IC&I generators (revision to 3Rs regulations).	• no additional effect noted	• no additional requirements	• no additional effect noted

Schedule Q-3
TABLE 1 - IC&I SYSTEM 3
EXTENDED 3Rs REGULATIONS
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: IC&I Extended 3Rs System
CRITERIA GROUP: Service
CRITERIA: Flexibility
INDICATOR: Types & Range of Quantities of Wastes Accepted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Collection - Dry Wastes • Mandatory source separation of designated materials by most IC&I generators in GTA (to capture 90% of total IC&I waste generation) • Voluntary source separation of dry recyclables by small IC&I generators • Collection of source separated dry recyclables from the IC&I sector by private sector haulers and recyclers • Curbside collection of IC&I recyclables in some areas by municipal forces • IC&I depots at transfer stations for use by small business generators • Landfill bans on specified materials (e.g. wood, tires, drywall, scrap metal, white goods, fine paper etc.)	• technology can handle majority of IC&I dry wastes, though some technical limitations particularly with plastics - low density/high volume make transport/storage difficult, also identification of plastic types • haulers and operators will respond with added range and volumes of materials collected • reluctance of some IC&I generators to source separate materials • regulations require certain sectors - manufacturing, retail and wholesale, to source separate longer list of materials • success depends on effective identification of materials for source separation, and compliance with revised regulations	• expansion of range and quantity of materials collected requires support through promotion, education and market development efforts • there is a need to ensure enforcement of landfill bans and private sector operation of facilities that are consistent with Certificates of Approval	• positive effect on waste diversion by increasing the number of companies required to recycle and therefore the quantity of materials diverted • technology is flexible to handle increase in range and quantity of materials in most cases • processing/marketing of some plastics likely to present problems

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Collection – Wet Wastes • Voluntary source separation of IC&I generated organics. • Separate collection of IC&I wet wastes	• technology can handle source separated wet waste • possible increase in wet wastes for processing corresponding to required source separation of dry wastes though efforts voluntary - these impacts not considered in diversion estimates • quality of wet waste affects the ability to produce high quality end products	• promotion/education concerning proper source separation practices • increase promotion/education of advantages or organic collection	• source separation of wet organics has positive effect on diversion and overall quality of dry recyclables
IC&I Processing – Dry Wastes • Additional processing capacity for dry recyclables required • Processing of specific dry materials (e.g. C&D wastes, wood, drywall) in specially designed facilities • Processing centres for a wide range of dry recyclables collected from the IC&I sector, owned by the private sector and operated by private sector staff • Processing of IC&I sector recyclables in municipal MRF's. • Processing of IC&I sector recyclables by small private sector recyclers	• private sector processing capacity will expand to handle additional quantities of materials requiring processing • some technical limitations on processing particularly with plastics - low density/light weight; also identification and separation of different plastic types - mixing plastic resins significantly complicates reprocessing • subject to stockpiling of particular materials depending on market conditions • possible disposal of a percentage of contaminated recyclables • range of materials collected and processed by private sector will depend on availability of markets	• market development support will be required to accommodate increase quantity of materials • markets may not have flexibility to absorb all processed materials • innovative end uses should be developed to ensure diversion	• increase in range and quantity of materials processed possible, with positive effect on waste diversion

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Processing - Wet Wastes • Centralized windrow composting of source separated IC&I organics (e.g. Scotts Farm) • On-site composting of source separated organics generated by the IC&I sector • Centralized composting of IC&I organics in in-vessel system • Vermicomposting at some IC&I locations • Rendering of food wastes from IC&I sector	• technology can handle essentially all source separated wet waste • existing and proposed expansions provide adequate capacity • possible increase in wet wastes for processing corresponding to required source separation of dry wastes - not considered in our diversion estimates • quality of wet waste affects the ability to produce high quality end products	• support for market development efforts for end products	• technology is flexible • potential to increase quantity of wet wastes diverted depends on market demand and quality of end products
IC&I Reuse • Reuse by IC&I generators, through the Canadian, Provincial (e.g. Ontario Waste Exchange) and local waste exchange programs (e.g. Durham) • Community-based reuse programs for small IC&I generators (WASTEWISE - Halton) • Use of food wastes as animal feed • Use of food waste for human consumption • Landspreading of IC&I organics • Use of refillable containers (refillable bottles, refillable pails or drums) • Use of reusable packaging (e.g. reusable plastic and wood pallets)	• scope for increasing reuse of material • reduced overall diversion costs may be achieved • increased number of establishments subject to requirement of packaging and waste audits and waste reduction plans potentially will increase identification of reuse opportunities positively affecting diversion • some limitations on reuse applications due to health/safety concerns	• increase of promotion/education of options available to generators • support of innovation for reusable products and programs	• technology is flexible to handle wide range of products

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
<u>IC&I Reduction</u> • Voluntary waste reduction actions by IC&I generators. • Voluntary reduction of packaging waste by 25% by the year 2000 (NAPP). • Mandatory development of waste reduction action plans by most IC&I generators (revision to 3Rs regulations). • Mandatory development of packaging reduction action plans by major packaging generators (defined in 3Rs regulations).	• innovations in packaging can focus on lightweighting and material reuse and present significant reduction opportunities • increased number of packaging audits and waste reduction plans will likely indicate reduction opportunities for some waste materials	• increase the promotion/education of the range of reduction opportunities	• positive affect on waste diversion and potential for cost savings
<u>IC&I Programs</u> • Voluntary waste audits performed by small IC&I generators. • Independent voluntary waste reduction programs in private companies. • Mandatory waste audits by most IC&I generators (revision to 3Rs regulations). • Mandatory packaging audits by major packaging generators (3Rs regulations). • Voluntary packaging reporting by packaging users (NAPP).	• waste and packaging audits help to identify waste and other inefficiencies • can identify a broad range of materials that could be diverted • increased number of organizations (over system 2) having such programs may identify opportunities for diversion of a wider range and quantity of wastes	• facilitate and provide technical support to establish waste audit and workplan programs for IC&I generators • promotion of market development as part of waste reduction plans where appropriate	• increasing the range of materials addressed by programs has positive effect on quantity of materials diverted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Promotion & Education			
• IC&I information hotline (Metro) • Promotion/education program focused on reducing waste disposed by the IC&I sector, carried out by the regional municipality • Promotion/education of IC&I waste reduction by non-profit organizations (e.g. RCO) • Promotion/education of IC&I waste reduction by associations • Mandatory posting of waste reduction plans for review by employees by most IC&I generators (revision to 3Rs regulations)	• promotion and education programs can focus on any range of materials • increased number of establishments subject to mandatory posting of waste reduction plans for employee review can positively affect diversion at all stages	• continue to provide promotion/education services that focus IC&I generators on the range of materials and opportunities available • focus should also be directed at procurement of recycled content goods and products that will help with the demand side of the end markets	• increasing education initiatives have potentially positive effect on waste diversion

TABLE 1 – IC&I SYSTEM 3
EXTENDED 3Rs REGULATIONS
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: IC&I Extended 3Rs System
CRITERIA GROUP: Service
CRITERIA: Performance
INDICATOR: Quantity Diverted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Collection – Dry Wastes • Mandatory source separation of designated materials by most IC&I generators in GTA (to capture 90% of total IC&I waste generation). • Voluntary source separation of dry recyclables by small IC&I generators. • Collection of source separated dry recyclables from the IC&I sector by private sector haulers and recyclers. • Curbside collection of IC&I recyclables in some areas by municipal forces. • IC&I depots at transfer stations for use by small business generators • Landfill bans on specified materials (e.g. wood, tires, drywall, scrap metal, white goods, fine paper etc.).	• extending mandatory source separation of dry recyclables potentially results in significant diversion from landfill • estimated to divert 55% of waste, from landfill • success depends on effective design of regulations to identify and regulate establishments which generate most (90%) of IC&I waste (note: in this system 90% of most types of plastics and wood waste generated by the manufacturing, wholesale and retail sectors has been targeted) • success depends on effective identification of materials for separation, particularly important in manufacturing, retail and wholesale sectors which are subject to separating an expanded list of materials.	• continue promotion/education regarding source separation for 3Rs • support development of markets	• increased mandatory source separation and collection of dry wastes potentially has positive effect on diversion • markets must be available to achieve diversion

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Collection – Wet Wastes • Voluntary source separation of IC&I generated organics • Separate collection of IC&I wet wastes	• Voluntary source separation of wet wastes potentially increases diversion from landfill • positive affect on separation and processing of dry recyclables (decreases contamination, increases diversion potential) • source separating of contaminants from wet organics has positive affect on marketability and diversion • not all generators voluntarily participate effectively in source separation of wet wastes	• continue promotion/education regarding source separation of wet wastes • encourage effective source separation of wet organic waste to ensure marketability of end products	• source separation and collection of wet waste contributes to waste diversion
IC&I Processing – Dry Wastes • Additional processing capacity for dry recyclables required • Processing of specific dry materials (e.g. C&D wastes, wood, drywall) in specially designed facilities • Processing centres for a wide range of dry recyclables collected from the IC&I sector owned by the private sector and operated by private sector staff (e.g. Laidlaw MRF, Mississauga or BFI MRF Concord) • Processing of IC&I sector recyclables in municipal MRF's • Processing of IC&I sector recyclables by small private sector recyclers	• processing of dry wastes has a positive affect on diversion of dry recyclables • potential diversion of 55% of dry recyclables from landfills • diversion depends on markets for products - potentially recoverable materials often sent to landfill when market not strong • diversion at processing stage depends on contamination of dry recyclables • some limitations in processing of mixed plastics	• continue/extend promotion of source separation • development of markets for dry waste materials • develop effective technology and end markets for all plastics	• increased mandatory source separation increases requirement for processing and has a potentially positive effect on waste diversion

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Processing – Wet Wastes • Centralized windrow composting of source-separated IC&I organics (e.g. Scotts Farm). • On-site composting of source separated organics generated by the IC&I sector. • Centralized composting of IC&I organics in in-vessel system. • Vermicomposting at some IC&I locations. • Rendering of food wastes from IC&I sector.	• positive affect through various uses • organics estimated at 7-8% of IC&I stream • current diversion low	• promotion/education regarding source separation of wet wastes • encourage effective source separation of materials to enhance marketability of wet organic waste products	• positive effect on waste diversion
IC&I Reuse • Reuse by IC&I generators, through the Canadian, Provincial (e.g. Ontario Waste Exchange) and local waste exchange programs (e.g. Durham). • Community-based reuse programs for small IC&I generators (WASTEWISE, Halton). • Use of food wastes as animal feed. • Use of food waste for human consumption. • Landspreading of IC&I organics • Use of refillable containers (refillable bottles, refillable pails or drums). • Use of re-usable packaging (e.g. reusable plastic and wood pallets).	• positive effect on diversion through reuse of items and materials • difficult to quantify reuse effect	• increase promotion of potential for reuse of wastes • support innovation for reusable items	• potential for increased waste diversion and reduced waste disposal - difficult to quantify

Component Category Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Reduction • Voluntary waste reduction actions by IC&I generators • Voluntary reduction of packaging waste by 25% by the year 2000 (NAPP) • Mandatory development of waste reduction action plans by most IC&I generators (revision to 3Rs regulations) • Mandatory development of packaging reduction action plans by major packaging generators (defined in 3Rs regulations)	• positive effect on diversion through waste reduction • difficult to quantify waste reduction effect. Some quantification possible at future date through on-going assessment of programs to NAPP goals	• promotion of potential for waste reduction • facilitate organization efforts for waste reduction • support for innovation in waste reduction • develop monitoring system to measure impacts	• potential positive effect on waste diversion - difficult to quantify
IC&I Programs • Voluntary waste audits performed by small IC&I generators • Independent voluntary waste reduction programs in private companies • Mandatory waste audits by most IC&I generators (revision to 3Rs regulations) • Mandatory packaging audits by major packaging generators (3Rs regulations) • Voluntary packaging reporting by packaging users (NAPP).	• potentially positive effect on diversion through increased awareness of opportunities for waste reduction • difficult to quantify waste reduction and diversion impacts • on-going assessment of programs toward NAPP goals	• promotion/education regarding potential of 3Rs programs • develop monitoring system to measure impacts	• potential positive affect on waste diversion and waste reductions - difficult to quantify on large scale

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
<u>IC&I Promotion & Education</u> • IC&I information hotline (Metro). • Promotion/education program focused on reducing waste disposed by the IC&I sector, carried out by the regional municipality. • Promotion/education of IC&I waste reduction by non-profit organizations (e.g. RCO) • Promotion/education of IC&I waste reduction by associations • Mandatory posting of waste reduction plans for review by employees by most IC&I generators (revision to 3Rs regulations).	• generally believed to have positive effects on waste diversion • difficult to quantify affect of promotion/education on waste diversion	• maintain/extend existing promotion/education as appropriate to explain requirements of extended 3Rs regulations	• potential positive affect on waste diversion and reduction

TABLE 1 – IC&I SYSTEM 4
EXPANDED 3Rs REGULATIONS
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: IC&I Expanded 3Rs System
CRITERIA: Reliability
INDICATOR: Proven Technology

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Collection – Dry Wastes • Voluntary source separation of dry recyclables by some small IC&I generators. • Collection of source separated dry recyclables from the IC&I sector by private sector haulers and recyclers. • Curbside collection of IC&I recyclables in some areas by municipal forces. • IC&I depots at transfer stations for use by small business generators • Landfill bans on specified materials (e.g. wood, tires, drywall, scrap metal, white goods, fine paper etc.). • Mandatory source separation of expanded list of designated materials by most IC&I generators (revision to 3Rs regulations).	• proven technology - some limitations on collection and separation of plastics - low density/high volume, complications in processing mixed plastics • increase in number of IC&I generators that will be required to source separate longer list of materials, including plastics • mixed paper added to list of materials for mandatory source separation - papers more easily separated and collected • regulations aiming for 90% capture of IC&I waste materials not proven • not all waste generators subject to regulation will want to source separate wastes • success depends on effective design of regulations to identify and regulate establishments which generate most (90%) of IC&I waste (note: in this system 90% of most types of plastics, mixed paper and wood waste generated by all sectors have been targeted) • success depends on effective identification of materials for separation	• increase education/promotion/ monitoring to ensure waste generators complying with regulations • effective monitoring and follow-up required to ensure compliance and effective source separation	• proven technology with positive effect on waste diversion

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Collection - Wet Wastes • Voluntary source separation of IC&I generated organics • Separate collection of IC&I wet wastes	• proven technology • some generators will be reluctant to store wet wastes	• increase education/promotion to encourage effective separation of wet organics to enhance composting and other uses	• proven technology contributing to waste diversion
IC&I Processing - Dry Wastes • Additional processing capacity for wider list of dry materials required • Processing of specific dry materials (e.g. C&D wastes, wood, drywall) in specially designed facilities • Processing centres for dry recyclables collected from the IC&I sector, owned by the private sector and operated by private sector staff • Processing of IC&I sector recyclables in municipal MRFs • Processing of IC&I sector recyclables by small private sector recyclers	• proven technology for source separated materials • technical limits for some waste streams and materials (e.g. construction & demolition wastes, mixed plastics) • few operational problems • some noise/dust and other siting related issues • subject to stockpiling of particular materials depending on market conditions • possible disposal of a percentage of contaminated recyclables • range of materials collected and processed by private sector will depend on availability of markets - markets for some materials included for extensive source separation not well-developed (e.g. boxboard, many plastics and glass) • reprocessing capacity may not exist locally (eg. polycoat containers) so active market identification required	• develop/stabilize markets - particularly plastics and boxboard • site away from residential areas • enforcement of private sector processing facilities to ensure compliance with Certificates of Approval • develop technology for processing all plastics economically	• proven technology for most materials contributing to diversion for reprocessing and reuse

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Processing – Wet Wastes • Centralized windrow composting of source-separated IC&I organics (e.g. Scotts Farm). • On-site composting of source separated organics generated by the IC&I sector. • Centralized composting of IC&I organics in in-vessel system. • Vermicomposting at some IC&I locations. • Rendering of food wastes from IC&I sector.	• proven technology • some operational problems – odour problems can be problematic – product quality can be inconsistent • not all IC&I wet wastes are compostable or suitable for other uses due to contaminants - effective source separation of organics required	• encourage effective source separation of wet organics – promotion/education and incentives required • careful management of composting process • site away from residential areas	• proven technology-significant mass/volume reduction • greatest benefit when finished compost marketable
IC&I Reuse • Reuse by IC&I generators, through the Canadian, Provincial (e.g. Ontario Waste Exchange) and local waste exchange programs (e.g. Durham). • Community-based reuse programs for small IC&I generators (WASTEWISE, Halton). • Use of food wastes as animal feed. • Use of food waste for human consumption. • Landspreading of IC&I organics • Use of refillable containers (refillable bottles, refillable pails or drums). • Use of re-usable packaging (e.g. reusable plastic and wood pallets).	• no additional effect noted	• no additional requirements	• no additional effect noted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Reduction • Voluntary waste reduction actions by small IC&I generators • Voluntary reduction of packaging waste by 25% by the year 2000 (NAPP) • Mandatory development of waste reduction action plans by most IC&I generators (revision to 3Rs regulations) • Mandatory development of packaging reduction action plans by major packaging generators (revision to 3Rs regulations)	• no additional effect noted	• no additional requirements	• no additional effect noted
IC&I Programs • Voluntary waste audits performed by small IC&I generators • Independent voluntary waste reduction programs in small private companies • Mandatory waste audits by most IC&I generators (revision to 3Rs regulations) • Mandatory packaging audits by major packaging generators (3Rs regulations) • Voluntary packaging reporting by packaging users (NAPP)	• no additional effect noted	• no additional requirements	• no additional effect noted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Promotion & Education • IC&I information hotline (Metro). • Promotion/education program focused on reducing waste disposed by the IC&I sector, carried out by the regional municipality. • Promotion/education of IC&I waste reduction by non-profit organizations (e.g. RCO) • Promotion/education of IC&I waste reduction by associations • Mandatory posting of waste reduction plans for review by employees by most IC&I generators (revision to 3Rs regulations).	• No additional effect noted	• no additional requirements	• no additional effect noted

Schedule Q-4
TABLE 1 - IC&I SYSTEM 4
EXPANDED 3Rs REGULATIONS
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: IC&I Expanded 3Rs System
CRITERIA GROUP: Service
CRITERIA: Flexibility
INDICATOR: Types and Range of Quantities of Waste Accepted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Collection – Dry Wastes • Mandatory source separation of expanded list of designated materials by most IC&I generators (revision to 3Rs regulations) • Voluntary source separation of dry recyclables by some small IC&I generators • Collection of source separated dry recyclables from the IC&I sector by private sector haulers and recyclers • Curbside collection of IC&I recyclables in some areas by municipal forces • IC&I depots at transfer stations for use by small business generators • Landfill bans on specified materials (e.g. wood, tires, drywall, scrap metal, white goods, fine paper etc.)	• technology can handle majority of IC&I dry wastes, though some technical limitations particularly with plastics - low density/high volume make transport/storage difficult; also identification of plastic types • added mixed paper to list of mandatory source-separated materials • number of establishments which are required to source separate long list of materials will increase from system 3 (manufacturing, wholesale and retail) to cover all sectors. This will have potential positive effect on quantities of those materials collected • haulers and operaters will respond with added range and volumes of materials collected • reluctance of some IC&I generators to source separate materials • success depends on effective identification of materials for source separation	• expansion of range and quantity of materials collected requires support through promotion/education • the is a need to ensure enforcement of landfill bans and private sector operation of facilities that are consistent with Certificates of Approval • significant market development effort required to ensure that collected wastes are diverted	• positive effect on diversion by increasing the number of companies required to recycle and therefore the quantity of materials diverted • technology is flexible to handle increase in range and quantity of most materials • technical limitations for some materials (e.g. plastics)

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Collection – Wet Wastes • Voluntary source separation of IC&I generated organics. • Separate collection of IC&I wet wastes	• technology can handle source separated wet waste • quality of wet waste affects the ability to produce high quality end products	• promotion/education concerning proper source separation practices • increase promotion/education of advantages of organic collection	• source separation has positive effect on diversion and overall quality of dry recyclables
IC&I Processing – Dry Wastes • Additional processing capacity for wider list of dry materials required • Processing of specific dry materials (e.g. C&D wastes, wood, drywall) in specially designed facilities • Processing centres for dry recyclables collected from the IC&I sector, owned by the private sector and operated by private sector staff • Processing of IC&I sector recyclables in municipal MRF's. • Processing of IC&I sector recyclables by small private sector recyclers	• private sector processing capacity will increase to handle additional quantities of materials collected • some technical limitations on processing particularly with plastics - low density/light weight; also identification and separation of different plastic types - mixing plastic resins significantly complicates reprocessing • subject to stockpiling of particular materials depending on market conditions • possible disposal of a percentage of contaminated recyclables • range of materials collected and processed by private sector will depend on availability of markets	• market development support will be required to accommodate increased quantity of materials - particularly plastics and mixed fibres such as boxboard	• increase in range and quantity of materials processed possible with positive effect on waste diversion

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Processing – Wet Wastes • Centralized windrow composting of source-separated IC&I organics (e.g. Scotts Farm) • On site composting of source separated organics generated by the IC&I sector • Centralized composting of IC&I organics in in-vessel system • Vermicomposting at some IC&I locations • Rendering of food wastes from IC&I sector	• no additional effect noted	• no additional effect noted	• no additional effect noted
IC&I Reuse • Reuse by IC&I generators, through the Canadian, Provincial (e.g. Ontario Waste Exchange) and local waste exchange programs (e.g. Durham) • Community-based reuse programs for small IC&I generators (WASTEWISE Halton) • Use of food wastes as animal feed • Use of food waste for human consumption • Landspreading of IC&I organics • Use of refillable containers (refillable bottles, refillable pails or drums) • Use of reusable packaging (e.g. reusable plastic and wood pallets)	• scope for increasing reuse of material • reduced overall diversion costs may be achieved • possible increase in number of establishments subject to requirement of packaging and waste audits and waste reduction plans potentially will increase identification of reuse opportunities positively affecting diversion	• increase of promotion/education of options available to generators • support of innovation for reusable products and programs	• technology is flexible to handle wide range of products

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
<u>IC&I Reduction</u> • Voluntary waste reduction actions by small IC&I generators. • Voluntary reduction of packaging waste by 25% by the year 2000 (NAPP). • Mandatory development of waste reduction action plans by most IC&I generators (revision to 3Rs regulations). • Mandatory development of packaging reduction action plans by major packaging generators (revision to 3Rs regulations).	• innovations in packaging will focus on lightweighting and material reuse and can present significant reduction opportunities • possible increased number of packaging audits and waste reduction plans potentially will indicate reduction opportunities for a wider range of waste materials	• increase the promotion/education of the range of reduction opportunities	• positive affect on diversion and potential for cost savings
<u>IC&I Programs</u> • Voluntary waste audits performed by small IC&I generators. • Independent voluntary waste reduction programs in small private companies. • Mandatory waste audits by most IC&I generators (revision to 3Rs regulations). • Mandatory packaging audits by major packaging generators (3Rs regulations). • Voluntary packaging reporting by packaging users (NAPP).	• waste and packaging audits help to identify waste and other inefficiencies • can identify a broad range of materials that could be diverted • possible increase in number of organizations (over system 3) having programs and therefore identifying opportunities	• facilitate and provide technical support to establish waste audit and workplan programs for IC&I generators • promotion of market development (through purchasing specifications) as part of waste reduction plans where appropriate	• increasing the range of materials addressed by programs has positive effect on quantity of materials diverted, if markets can be found for all materials

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Promotion & Education • IC&I information hotline (Metro) • Promotion/education program focused on reducing waste disposed by the IC&I sector carried out by the regional municipality • Promotion/education of IC&I waste reduction by non-profit organizations (e.g. RCO) • Promotion/education of IC&I waste reduction by associations • Mandatory posting of waste reduction plans for review by employees by most IC&I generators (revision to 3Rs regulations)	• promotion and education programs can focus on any range of materials • increased number of establishments subject to mandatory posting of waste reduction plans for employee review can positively affect diversion at all stages	• continue to provide promotion/education services that focus IC&I generators on the range of materials and opportunities available • focus should also be directed at procurement of recycled content goods and products that will help with the demand side of end markets	• increasing education initiatives potentially positive effect on diversion

TABLE 1 – IC&I SYSTEM 4
EXPANDED 3Rs REGULATIONS
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: IC&I Expanded 3Rs System
CRITERIA GROUP: Service
CRITERIA: Performance
INDICATOR: Quantity Diverted or Requiring Landfilling

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Collection – Dry Wastes • Voluntary source separation of dry recyclables by some small IC&I generators. • Collection of source separated dry recyclables from the IC&I sector by private sector haulers and recyclers. • Curbside collection of IC&I recyclables in some areas by municipal forces. • IC&I depots at transfer stations for use by small business generators • Landfill bans on specified materials (e.g. wood, tires, drywall, scrap metal, white goods, fine paper etc.). • Mandatory source separation of expanded list of designated materials by most IC&I generators (revision to 3Rs regulations).	• expanding mandatory source separation of dry recyclables potentially results in significant diversion from landfill • estimated to divert approximately 64% dry recyclables from landfill • success depends on effective design of regulations to identify and regulate establishments which generate most (90%) of IC&I waste (note: in this system 90% of most types of plastics, mixed paper and wood waste generated by all sectors has been targeted) • success depends on effective identification of materials for separation,	• continue promotion/education regarding source separation for 3Rs • support development of markets	• increased mandatory source separation and collection of dry wastes potentially has positive effect on waste diversion
IC&I Collection – Wet Wastes • Voluntary source separation of IC&I generated organics. • Separate collection of IC&I wet wastes	• no additional effect noted	• no additional effect noted	• no additional effect noted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Processing – Dry Wastes • Additional processing capacity for wider list of dry materials required • Processing of specific dry materials (e.g. C&D wastes wood, drywall) in specially designed facilities • Processing centres for dry recyclables collected from the IC&I sector owned by the private sector and operated by private sector staff • Processing of IC&I sector recyclables in municipal MRFs • Processing of IC&I sector recyclables by small private sector recyclers	• processing of dry wastes has a positive affect on diversion of dry recyclables • potential diversion of approximately 64% dry recyclables from landfill • diversion depends on markets for products potentially recoverable materials often sent to landfill when market not strong • diversion at processing stage depends on contamination of dry recyclables • also some limitations in processing mixed plastics	• continue/extend promotion of source separation • development of markets for dry waste materials critical to success of this system in diverting additional waste	• increased mandatory source separation increases requirement for processing and has a potentially positive effect on waste diversion
IC&I Processing – Wet Wastes • Centralized windrow composting of source separated IC&I organics (e.g. Smits Farm) • On-site composting of source separated organics generated by the IC&I sector • Centralized composting of IC&I organics in in-vessel system • Vermicomposting at some IC&I locations • Rendering of food wastes from IC&I sector	• no additional effect noted	• no additional effect noted	• no additional effect noted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
<u>IC&I Reuse</u> • Reuse by IC&I generators, through the Canadian, Provincial (e.g. Ontario Waste Exchange) and local waste exchange programs (e.g. Durham). • Community-based reuse programs for small IC&I generators (WASTEWISE, Halton). • Use of food wastes as animal feed. • Use of food waste for human consumption. • Landspreading of IC&I organics • Use of refillable containers (refillable bottles, refillable pails or drums). • Use of re-usable packaging (e.g. reusable plastic and wood pallets).	• no additional effect noted	• no additional effect noted	• no additional effect noted
<u>IC&I Reduction</u> • Voluntary waste reduction actions by small IC&I generators. • Voluntary reduction of packaging waste by 25% by the year 2000 (NAPP). • Mandatory development of waste reduction action plans by most IC&I generators (revision to 3Rs regulations). • Mandatory development of packaging reduction action plans by major packaging generators (revision to 3Rs regulations).	• no additional effect noted	• no additional effect noted	• no additional effect noted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Programs • Voluntary waste audits performed by small IC&I generators • Independent voluntary waste reduction programs in small private companies • Mandatory waste audits by most IC&I generators (revision to 3Rs regulations) • Mandatory packaging audits by major packaging generators (3Rs regulations) • Voluntary packaging reporting by packaging users (NAPP)	• no additional effect noted	• no additional effect noted	• no additional effect noted
IC&I Promotion & Education • IC&I information hotline (Metro) • Promotion/education program focused on reducing waste disposed by the IC&I sector, carried out by the regional municipality • Promotion/education of IC&I waste reduction by non-profit organizations (e.g. RCO) • Promotion/education of IC&I waste reduction by associations • Mandatory posting of waste reduction plans for review by employees by most IC&I generators (revision to 3Rs regulations)	• difficult to quantify affect of promotion/education on waste diversion • generally believed to have positive effects on most 3Rs activities	• maintain/extend existing promotion/education as appropriate, to describe requirements of expanded 3Rs regulations	• potential positive affect on waste diversion and reduction

Schedule Q-5

TABLE 1 – IC&I SYSTEM 5

EXPANDED 3Rs REGULATIONS WITH ORGANICS

GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: IC&I Expanded 3Rs with Organics System

CRITERIA GROUP: Service

CRITERIA: Reliability

INDICATOR: Proven Technology

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Collection – Dry Wastes • Voluntary source separation of dry recyclables by small IC&I generators. • Collection of source separated dry recyclables from the IC&I sector by private sector haulers and recyclers. • Curbside collection of IC&I recyclables in some areas by municipal forces. • IC&I depots at transfer stations for use by small business generators • Landfill bans on specified materials (e.g. wood, tires, drywall, scrap metal, white goods, fine paper etc.). • Mandatory source separation of designated materials by most generators (revision to 3Rs regulations).	• no additional effect noted	• no additional requirements	• no additional effect noted

IC&I Expanded 3Rs with Organics System - Reliability (cont'd)

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Collection - Wet Wastes • Mandatory source separation of wet wastes by designated IC&I generators (revision to 3Rs regulations) • Voluntary source separation of IC&I generated organics • Separate collection of IC&I wet wastes	• proven technology for handling wet wastes • extensive system of mandatory separation/collection of IC&I wet wastes not proven • some generators will be reluctant to store wet wastes	• increase education/promotion to encourage separation and storage of wet wastes • increase education/promotion to encourage effective separation of wet organics to enhance composting and other uses	• proven technology contributing to waste diversion though not proven on scale proposed
IC&I Processing - Dry Wastes • Processing of specific dry materials (e.g. C&D wastes, wood, drywall) in specially designed facilities • Processing centres for dry recyclables collected from the IC&I sector, owned by the private sector and operated by private sector staff (e.g. Laidlaw MRF, Mississauga or BFI MRF Concord) • Processing of IC&I sector recyclables in municipal MRFs • Processing of IC&I sector recyclables by small private sector recyclers • Additional processing capacity for dry recyclables	• no additional effect noted	• no additional requirements	• no additional effect noted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Processing – Wet Wastes • Centralized windrow composting of source-separated IC&I organics (e.g. Scotts Farm). • On-site composting of source separated organics generated by the IC&I sector. • Centralized composting of IC&I organics in in-vessel system. • Vermicomposting at some IC&I locations. • Rendering of food wastes from IC&I sector. • New composting facility for IC&I organics • Composting of IC&I organics in municipal in-vessel system.	• proven technology • some operational problems – odour problems can be problematic – product quality can be inconsistent • not all IC&I wet wastes are compostable or suitable for other uses due to contaminants - effective source separation of organics required to ensure marketability • Market development required to lower costs and ensure maximum diversion	• encourage effective source separation of wet organics – promotion/education and incentives required • careful management of composting process • site away from residential areas • market development required to optimally handle increased quantity of organics • compost quality standards may limit end uses of finished compost	• composting is proven technology-significant mass/volume reduction achieved • not implemented at scale proposed for GTA
IC&I Reuse • Reuse by IC&I generators, through the Canadian, Provincial (e.g. Ontario Waste Exchange) and local waste exchange programs (e.g. Durham). • Community-based reuse programs for small IC&I generators (WASTEWISE, Halton). • Increased use of food wastes as animal feed. • Increased use of food waste for human consumption. • Increased landspreading of IC&I organics • Use of refillable containers such as packaging by businesses (refillable bottles, refillable pails or drums, etc.). • Use of re-usable packaging (e.g. reusable plastic and wood pallets).	• no additional effect noted	• no additional requirements	• no additional effect noted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Reduction • Voluntary waste reduction actions by small IC&I generators • Voluntary reduction of packaging waste by 25% by the year 2000 (NAPP) • Mandatory development of waste reduction action plans by most IC&I generators (revision to 3Rs regulations) • Mandatory development of packaging reduction action plans by major packaging generators (defined in 3Rs regulations)	• possible increase in number of establishments doing waste audits and waste reduction plans may lead to further waste reduction initiatives	• no additional requirements	• possible positive effect from increased number of audits and waste reduction plans
IC&I Programs • Voluntary waste audits performed by small IC&I generators • Independent voluntary waste reduction programs in small private companies • Mandatory waste audits by most IC&I generators (revision to 3Rs regulations) • Mandatory packaging audits by major packaging generators (3Rs regulations) • Voluntary packaging reporting by packaging users (NAPP)	• possible increase in number of establishments doing waste audits and waste reduction plans may lead to further waste reduction initiatives	• no additional requirements	• possible positive effect from increased number of audits and waste reduction plans

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
<u>IC&I Promotion & Education</u> • IC&I information hotline (Metro). • Promotion/education program focused on reducing waste disposed by the IC&I sector, carried out by the regional municipality. • Promotion/education of IC&I waste reduction by non-profit organizations (e.g. RCO) • Promotion/education of IC&I waste reduction by associations • Mandatory posting of waste reduction plans for review by employees by most IC&I generators (revision to 3Rs regulations).	• No additional effect noted	• no additional requirements	• no additional effect noted

Schedule Q-5

TABLE 1 – IC&I SYSTEM 5

EXPANDED 3Rs REGULATIONS WITH ORGANICS

GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: IC&I Expanded 3Rs with Organics System

CRITERIA GROUP: Service

CRITERIA: Flexibility

INDICATOR: Types and Range of Quantities of Wastes Accepted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Collection – Dry Wastes • Voluntary source separation of dry recyclables by small IC&I generators • Collection of source separated dry recyclables from the IC&I sector by private sector haulers and recyclers • Curbside collection of IC&I recyclables in some areas by municipal forces • IC&I depots at transfer stations for use by small business generators • Landfill bans on specified materials (e.g. wood, tires, drywall, scrap metal, white goods, fine paper etc.) • Mandatory source separation of designated materials by most generators (revision to 3Rs regulations)	• no additional effect noted	• no additional requirements	• no additional effect noted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
<u>IC&I Collection – Wet Wastes</u> • Mandatory source separation of wet wastes by designed IC&I generators (revision to 3Rs regulations). • Voluntary source separation of IC&I generated organics. • Separate collection of IC&I wet wastes	• additional mandatory separation of food and yard waste will increase range and quantity of wastes handled • markets to handle additional organic materials may not be sufficient • increased collection capacity will be required for wet organics	• further market development and increased collection capacity required	• requirement to separate increased quantity and range of materials - organics will have a positive effect on waste diversion
<u>IC&I Processing – Dry Wastes</u> • Processing of specific dry materials (e.g. C&D wastes, wood, drywall) in specially designed facilities. • Processing centres for dry recyclables collected from the IC&I sector, owned by the private sector and operated by private sector staff (e.g. Laidlaw MRF, Mississauga or BFI MRF, Concord). • Processing of IC&I sector recyclables in municipal MRF's. • Processing of IC&I sector recyclables by small private sector recyclers. • Additional processing capacity for dry recyclables.	• no additional effect noted	• no additional requirements	• no additional effect noted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Processing - Wet Wastes • Centralized windrow composting of source-separated IC&I organics (e.g. Scotts Farm) • On-site composting of source separated organics generated by the IC&I sector • Centralized composting of IC&I organics in in-vessel system • Vermicomposting at some IC&I locations • Rendering of food wastes from IC&I sector • New composting facility for IC&I organics • Composting of IC&I organics in municipal in-vessel system	• additional mandatory separation of food and yard waste will increase range and quantity of wastes handled • increased processing capacity will be required, though existing planned expansions may be sufficient • markets to handle additional organic materials may not be sufficient • quality of wet waste affects the ability to produce quality end products	• further market development required for finished compost • promotion/education concerning proper source separation practices	• requirement to process increased quantity and range of materials - organics will have a positive effect on waste diversion
IC&I Reuse • Reuse by IC&I generators, through the Canadian, Provincial (e.g. Ontario Waste Exchange) and local waste exchange programs (e.g. Durham) • Community-based reuse programs for small IC&I generators (WASTEWISE, Halton) • Increased use of food wastes as animal feed • Increased use of food waste for human consumption • Increased landspreading of IC&I organics • Use of refillable containers such as packaging by businesses (refillable bottles, refillable pails or drums, etc.) • Use of re-usable packaging (e.g. reusable plastic and wood pallets)	• no additional effect noted	• no additional requirements	• no additional effect noted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Reduction • Voluntary waste reduction actions by small IC&I generators • Voluntary reduction of packaging waste by 25% by the year 2000 (NAPP). • Mandatory development of waste reduction action plans by most IC&I generators (revision to 3Rs regulations). • Mandatory development of packaging reduction action plans by major packaging generators (defined in 3Rs regulations).	• no additional effect noted	• no additional requirements	• no additional effect noted
IC&I Programs • Voluntary waste audits performed by small IC&I generators. • Independent voluntary waste reduction programs in small private companies. • Mandatory waste audits by most IC&I generators (revision to 3Rs regulations). • Mandatory packaging audits by major packaging generators (3Rs regulations). • Voluntary packaging reporting by packaging users (NAPP).	• no additional effect noted	• no additional requirements	• no additional effect noted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Promotion & Education • IC&I information hotline (Metro) • Promotion/education program focused on reducing waste disposed by the IC&I sector carried out by the regional municipality • Promotion/education of IC&I waste reduction by non-profit organizations (e.g. RCO) • Promotion/education of IC&I waste reduction by associations • Mandatory posting of waste reduction plans for review by employees by most IC&I generators (revision to 3Rs regulations)	• no additional effect noted	• no additional requirements	• no additional effect noted

TABLE 1 – IC&I SYSTEM 5
EXPANDED 3Rs REGULATIONS WITH ORGANICS
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: IC&I Expanded 3Rs with Organics System
CRITERIA GROUP: Service
CRITERIA: Performance
INDICATOR: Quantity Diverted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Collection – Dry Wastes • Voluntary source separation of dry recyclables by small IC&I generators. • Collection of source separated dry recyclables from the IC&I sector by private sector haulers and recyclers. • Curbside collection of IC&I recyclables in some areas by municipal forces. • IC&I depots at transfer stations for use by small business generators • Landfill bans on specified materials (e.g. wood, tires, drywall, scrap metal, white goods, fine paper etc.). • Mandatory source separation of designated materials by most generators (revision to 3Rs regulations).	• no additional effect noted	• no additional requirements	• no additional effect noted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
<u>IC&I Collection – Wet Wastes</u> • Mandatory source separation of wet wastes by designated IC&I generators (revision to 3Rs regulations) • Voluntary source separation of IC&I generated organics • Separate collection of IC&I wet wastes	• expanding mandatory separation of wet organics (food and yard waste) potentially results in significant diversion from landfill • estimated diversion is 6.6% of IC&I waste • this provides for a total diversion of up to 70% of IC&I waste • success depends on effective design of regulations of identity and regulate establishments which generate most (90%) of the IC&I food and yard waste • success also depends on effective source separation of these wastes to ensure marketability • increased collection capacity for wet wastes is likely required	• education/promotion of effective source separation of organics to ensure marketability • active market development to ensure end uses for finished product	• mandatory source separation and collection of wet organics has potential positive effect on waste diversion
<u>IC&I Processing – Dry Wastes</u> • Processing of specific dry materials (e.g. C&D wastes, wood, drywall) in specially designed facilities • Processing centres for dry recyclables collected from the IC&I sector, owned by the private sector and operated by private sector staff (e.g. Laidlaw MRF, Mississauga or BFI MRF, Concord) • Processing of IC&I sector recyclables in municipal MRFs • Processing of IC&I sector recyclables by small private sector recyclers • Additional processing capacity for dry recyclables	• no additional effect noted	• no additional requirements	• no additional effect noted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Processing – Wet Wastes • Centralized windrow composting of source-separated IC&I organics (e.g. Scotts Farm). • On-site composting of source separated organics generated by the IC&I sector. • Centralized composting of IC&I organics in in-vessel system. • Vermicomposting at some IC&I locations. • Rendering of food wastes from IC&I sector. • New composting facility for IC&I organics • Composting of IC&I organics in municipal in-vessel system.	• expanding mandatory separation of wet organics (food and yard waste) potentially results in significant diversion from landfill • estimated diversion 6.6% of IC&I waste • this provides for a total diversion under system 5 of up to 70% of GTA IC&I waste • not all IC&I wet wastes are compostable or suitable for other uses due to contaminants - success depends on effective source separation of organics required to ensure marketability • Market development required to lower costs and ensure maximum diversion • planned expansions may be sufficient to provide capacity required for processing of significant stream of wet IC&I organics	• education/promotion of effective source separation of organics to ensure marketability • active market development to ensure adequate end use options for finished product • requires careful management of processing facilities to minimize operational problems • site facilities away from residential areas	• mandatory source separation and processing of wet organics has potential positive effect on waste diversion

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Reuse • Reuse by IC&I generators, through the Canadian, Provincial (e.g. Ontario Waste Exchange) and local waste exchange programs (e.g. Durham) • Community-based reuse programs for small IC&I generators (WASTEWISE, Halton) • Increased use of food wastes as animal feed • Increased use of food waste for human consumption • Increased landspreading of IC&I organics • Use of refillable containers such as packaging by businesses (refillable bottles, refillable pails or drums, etc.) • Use of re-usable packaging (e.g. reusable plastic and wood pallets)	• no additional effect noted	• no additional requirements	• no additional effect noted
IC&I Reduction • Voluntary waste reduction actions by small IC&I generators • Voluntary reduction of packaging waste by 25% by the year 2000 (NAPP) • Mandatory development of waste reduction action plans by most IC&I generators (revision to 3Rs regulations) • Mandatory development of packaging reduction action plans by major packaging generators (defined in 3Rs regulations)	• no additional effect noted	• no additional requirements	• no additional effect noted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Programs • Voluntary waste audits performed by small IC&I generators. • Independent voluntary waste reduction programs in small private companies. • Mandatory waste audits by most IC&I generators (revision to 3Rs regulations). • Mandatory packaging audits by major packaging generators (3Rs regulations). • Voluntary packaging reporting by packaging users (NAPP).	• no additional effect noted	• no additional requirements	• no additional effect noted
IC&I Promotion & Education • IC&I information hotline (Metro). • Promotion/education program focused on reducing waste disposed by the IC&I sector, carried out by the regional municipality. • Promotion/education of IC&I waste reduction by non-profit organizations (e.g. RCO) • Promotion/education of IC&I waste reduction by associations • Mandatory posting of waste reduction plans for review by employees by most IC&I generators (revision to 3Rs regulations).	• see comments System 4	• see comments System 4 • add promotion/education program focussing on diversion options for IC&I organics	• see comments System 4

TABLE 1 – IC&I SYSTEM 6
NO UNPROCESSED WASTE TO LANDFILL
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: IC&I No Unprocessed Waste To Landfill System
CRITERIA GROUP: Service
CRITERIA: Reliability
INDICATOR: Proven Technology

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Collection – Dry Wastes • Voluntary source separation of dry recyclables by small IC&I generators. • Collection of source separated dry recyclables from the IC&I sector by private sector haulers and recyclers. • Curbside collection of IC&I recyclables in some areas by municipal forces. • IC&I depots at transfer stations for use by small business generators • Landfill bans on specified materials (e.g. wood, tires, drywall, scrap metal, white goods, fine paper etc.). • Mandatory source separation of designated materials by most generators (revision to 3Rs regulations). • Mandatory processing of all dry wastes prior to landfilling (new policy required by Ontario, or condition on C of A for landfill).	• proven technology - variety of services could be expected varying from extensive source separation of a wide range of materials to a two-bin wet-dry system • mixed dry waste collection programs currently are operating in GTA • some limitations on collection and separation of plastics - low density/high volume, complications in processing mixed plastics • contamination of materials may be greater under mixed waste programs than under source separation programs - this may reduce diversion of specific materials • increase in number of IC&I generators that will be required to comply with regulations and pay for collection and processing	• promotion/education of 3Rs potential • continued promotion of source separation to improve recovery rates • aggressive market development	• proven technology • effect on waste diversion not proven on large scale

Component Category Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Collection - Dry Wastes Continued	• regulations prohibiting unprocessed waste being disposed in landfills not proven - Minneapolis has regulations requiring processing of waste in public or other designated facilities and have experienced resistance from haulers and recyclers to such waste flow controls - a significant fraction of the waste stream is incinerated to achieve diversion - the State of Minnesota has prohibited disposal of waste in unlined landfills, of which only two will remain by the end of 1993 • responsibility for effective separation falls on haulers/recyclers • responsibility for policing falls on landfill facilities and regions through C of As and designations		
IC&I Collection - Wet Wastes • Voluntary source separation of IC&I generated organics • Separate collection of some IC&I wet wastes	• proven technology for handling wet wastes • extensive system of separation/collection of IC&I wet wastes not proven • some generators will be reluctant to store wet wastes • potentially more contamination of wet organics than under System 5 • effectiveness of separation of wet wastes will effect end-product use and diversion • responsibility for effective separation falls on haulers/recyclers	• increase education/promotion to encourage separation and storage of wet wastes • increase education/promotion to encourage effective separation of wet organics to enhance composting and other uses	• proven technology contributing to waste diversion

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
<u>IC&I Processing – Dry Wastes</u> • Processing of specific dry materials (e.g. C&D wastes, wood, drywall) in specially designed facilities. • Processing centres for dry recyclables collected from the IC&I sector, owned by the private sector and operated by private sector staff • Processing of IC&I sector recyclables in municipal MRFs. • Processing of IC&I sector recyclables by small private sector recyclers • Mandatory processing of all dry wastes prior to landfilling (new policy). • Mandatory processing of all mixed wastes prior to landfilling (new policy).	• proven technology for source separated materials • mixed dry waste collection programs and processing facilities currently are operating in GTA • technical limits for some waste streams and materials (e.g. construction & demolition wastes, mixed plastics, multi-material items) • contamination of materials may be greater under mixed waste programs than under source separation programs • possible disposal of a percentage of contaminated recyclables • subject to stockpiling of particular materials depending on market conditions • range of materials collected and processed by private sector will depend on availability of markets - markets for some material not well-developed (e.g. boxboard, many plastics and glass) • reprocessing capacity may not exist locally (eg. polycoat containers) so active market identification required • few operational problems • some noise/dust and other siting related issues • responsibility for policing falls on haulers, recyclers and landfills • responsibility for policing falls on landfill facilities and regions through C of As and designations	• develop/stabilize markets and end uses for a number of processed wastes generated by this policy	• proven technology with positive effect on waste diversion for potential reprocessing and reuse • some technical limits for certain materials such as mixed plastics and C&D

Component Category Components	Component Effects	Mitigation Enhancement	Component Net Effects
<u>IC&I Recycling — Wet Waste</u> • Centralized windrow composting of source separated IC&I organics (e.g. Scotts Farm) • On-site composting of source separated organics generated by the IC&I sector • Centralized composting of IC&I organics in in-vessel system • Vermicomposting at some IC&I locations • Rendering of food wastes from IC&I sector • New composting facility for IC&I organics • Composting of IC&I organics in municipal in-vessel system	• proven technology • some operational problems — odour problems can be problematic — product quality can be inconsistent • not all IC&I wet wastes are compostable or suitable for other uses due to contaminant materials - effective source separation of organics required to ensure marketability • Market development required to lower costs and ensure maximum diversion • effective source separation will depend on how intent of policy implemented	• encourage effective source separation of wet organics — promotion/education and incentives required • careful management of composting process • site away from residential areas • market development required to optimally handle increased quantity of organics	• proven technology-significant mass/volume reduction achieved in composting • greatest benefit when product marketable
<u>IC&I Reuse</u> • Reuse by IC&I generators, through the Canadian, Provincial (e.g. Ontario Waste Exchange) and local waste exchange programs (e.g. Durham) • Community-based reuse programs for small IC&I generators (WASTEWISE, Halton) • Use of food wastes as animal feed • Use of food waste for human consumption • Landspreading of IC&I organics • Use of refillable containers (refillable bottles, refillable pails or drums, etc) • Use of reusable packaging (e.g. reusable plastic and wood pallets, etc.)	• no additional effect noted	• no additional requirements	• no additional effect noted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Reduction • voluntary waste reduction actions by small IC&I generators. • Voluntary reduction of packaging waste by 25% by the year 2000 (NAPP). • Mandatory development of waste reduction action plans by most IC&I generators (revision to 3Rs regulations). • Mandatory development of packaging reduction action plans by major packaging generators (defined in 3Rs regulations).	• no additional effect noted	• no additional requirements	• no additional effect noted
IC&I Programs • Voluntary waste audits performed by small IC&I generators. • Independent voluntary waste reduction programs in small private companies. • Mandatory waste audits by most IC&I generators (revision to 3Rs regulations). • Mandatory packaging audits by major packaging generators (3Rs regulations). • Voluntary packaging reporting by packaging users (NAPP).	• no additional effect noted	• no additional requirements	• no additional effect noted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Promotion & Education • IC&I information hotline (Metro) • Promotion/education program focused on reducing waste disposed by the IC&I sector, carried out by the regional municipality • Promotion/education of IC&I waste reduction by non-profit organizations (e.g. RCO) • Promotion/education of IC&I waste reduction by associations • Mandatory posting of waste reduction plans for review by employees by most IC&I generators (revision to 3Rs regulations)	• no additional effect noted	• no additional requirements	• no additional effect noted

TABLE 1 – IC&I SYSTEM 6
NO UNPROCESSED WASTE TO LANDFILL
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: IC&I No Unprocessed Waste To Landfill
CRITERIA GROUP: Service
CRITERIA: Flexibility
INDICATOR: Types and Range of Quantities of Wastes Accepted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Collection – Dry Wastes • Voluntary source separation of dry recyclables by small IC&I generators. • Collection of source separated dry recyclables from the IC&I sector by private sector haulers and recyclers. • Curbside collection of IC&I recyclables in some areas by municipal forces. • IC&I depots at transfer stations for use by small business generators • Landfill bans on specified materials (e.g. wood, tires, drywall, scrap metal, white goods, fine paper etc.). • Mandatory source separation of designated materials by most generators (revision to 3Rs regulations). • Mandatory processing of all dry wastes prior to landfilling (new policy required by Ontario, or condition on C of A for landfill).	• technology can handle majority of IC&I dry wastes, though some technical limitations particularly with plastics - low density/high volume make transport/storage difficult; also identification plastic types • contamination of materials may be greater under mixed waste programs than under source separation programs - this may reduce diversion of specific materials • increase in number of IC&I generators that will be required to comply with regulations has positive effect on range and amount of materials available for potential recovery	• expansion of range and quantity of materials collected requires support through promotion/education and market development efforts	• positive effect on waste diversion by increasing the quantity of waste materials collected • technology is flexible to handle increase in range and quantity of materials • policy ensures that efforts are made to divert as much waste as possible prior to landfilling

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Collection - Wet Wastes • Voluntary source separation of IC&I generated organics • Separate collection of some IC&I wet wastes	• contamination of wet organics may be greater than under System 5	• further market development and increased collection capacity • encourage source separation of organics where possible	• requirement to separate wet wastes increases quantity of organics available for processing and possible diversion • if collected as mixed stream, finished compost quality may limit end use options
IC&I Processing - Dry Wastes • Processing of specific dry materials (e.g. C&D wastes, wood, drywall) in specially designed facilities • Processing centres for dry recyclables collected from the IC&I sector, owned by the private sector and operated by private sector staff • Processing of IC&I sector recyclables in municipal MRFs • Processing of IC&I sector recyclables by small private sector recyclers • Mandatory processing of all dry wastes prior to landfilling (new policy) • Mandatory processing of all mixed wastes prior to landfilling (new policy)	• private sector processing capacity expansions/additions required to handle additional quantities of materials collected • some technical limitations on processing particularly with plastics - low density/light weight, also identification and separation of different plastic types - mixing plastic resins significantly complicates reprocessing • subject to stockpiling of particular materials depending on market conditions • possible disposal of a percentage of contaminated recyclables • range of materials collected and processed and method of processing used by private sector will depend on availability of markets	• market development support will be required to accommodate increased quantity, range and quality of materials	• increase in range and quantity of materials processed possible with positive effect on waste diversion if end uses/markets can be found

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
<u>IC&I Processing – Wet Wastes</u> • Centralized windrow composting of source-separated IC&I organics (e.g. Scotts Farm). • On-site composting of source separated organics generated by the IC&I sector. • Centralized composting of IC&I organics in in-vessel system. • Vermicomposting at some IC&I locations. • Rendering of food wastes from IC&I sector. • New composting facility for IC&I organics • Composting of IC&I organics in municipal in-vessel system	• amount of source separated wet waste processed will depend on level of (voluntary) source separation by generators • capacity available (existing or proposed) to handle significant quantities of source separated organics	• promotion/education concerning proper source separation practices	• requirement to process all materials will have a positive effect on waste diversion
<u>IC&I Reuse</u> • Reuse by IC&I generators, through the Canadian, Provincial (e.g. Ontario Waste Exchange) and local waste exchange programs (e.g. Durham). • Community-based reuse programs for small IC&I generators (WASTEWISE, Halton). • Use of food wastes as animal feed. • Use of food waste for human consumption. • Landspreading of IC&I organics • Use of refillable containers (refillable bottles, refillable pails or drums, etc). • Use of re-usable packaging (e.g. reusable plastic and wood pallets, etc.).	• no additional effect noted	• no additional requirements	• no additional effect noted

IC&I No Unprocessed Waste To Landfill System - Flexibility (cont'd)

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Reduction • voluntary waste reduction actions by small IC&I generators • Voluntary reduction of packaging waste by 25% by the year 2000 (NAPP) • Mandatory development of waste reduction action plans by most IC&I generators (revision to 3Rs regulations) • Mandatory development of packaging reduction action plans by major packaging generators (defined in 3Rs regulations)	• no additional effect noted	• no additional requirements	• no additional effect noted
IC&I Programs • Voluntary waste audits performed by small IC&I generators • Independent voluntary waste reduction programs in small private companies • Mandatory waste audits by most IC&I generators (revision to 3Rs regulations) • Mandatory packaging audits by major packaging generators (3Rs regulations) • Voluntary packaging reporting by packaging users (NAPP)	• no additional effect noted	• no additional requirements	• no additional effect noted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
<u>IC&I Promotion & Education</u> • IC&I information hotline (Metro). • Promotion/education program focused on reducing waste disposed by the IC&I sector, carried out by the regional municipality. • Promotion/education of IC&I waste reduction by non-profit organizations (e.g. RCO) • Promotion/education of IC&I waste reduction by associations • Mandatory posting of waste reduction plans for review by employees by most IC&I generators (revision to 3Rs regulations).	• no additional effect noted	• no additional requirements	• no additional effect noted

Schedule Q-6
TABLE 1 - IC&I SYSTEM 6
NO UNPROCESSED WASTE TO LANDFILL
GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: IC&I No Unprocessed Waste To Landfill
CRITERIA GROUP: Service
CRITERIA: Performance
INDICATOR: Quantity Diverted or Requiring Landfilling

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Collection - Dry Wastes • Voluntary source separation of dry recyclables by small IC&I generators • Collection of source separated dry recyclables from the IC&I sector by private sector haulers and recyclers • Curbside collection of IC&I recyclables in some areas by municipal forces • IC&I depots at transfer stations for use by small business generators • Landfill bans on specified materials (e.g. wood, tires, drywall, scrap metal, white goods, fine paper etc.) • Mandatory source separation of designated materials by most generators (revision to 3Rs regulations) • Mandatory processing of all dry wastes prior to landfilling (new policy required by Ontario, or condition on C of A for landfill)	• prohibiting disposal of unprocessed waste in landfills potentially results in significant diversion from landfill • estimated to divert approximately 70%-75% of IC&I waste, from landfill • success will depend on the extent of contamination of materials, and degree of source separation practiced to meet requirements of policy • success also will depend on the strength of markets for many materials	• continue promotion/education regarding source separation for 3Rs • support development of markets	• prohibiting disposal of unprocessed waste in landfills increases the amount of dry wastes collected and processed. Diversion options will likely be explored for processed wastes, hence policy likely has positive effect on waste diversion

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Collection – Wet Wastes • Voluntary source separation of IC&I generated organics. • Separate collection of some IC&I wet wastes	• prohibiting disposal of unprocessed waste in landfills, which would be simplified by separation of wet wastes, potentially results in significant diversion from landfill • estimated diversion of wet organics is approximately 5.8% of waste stream • this provides for a total diversion under System 6 of between 75%-80% of waste • success depends on effective source separation of these wastes to ensure marketability • increased collection capacity for source separated organics likely required	• education/promotion of effective source separation of organics to ensure marketability • active market development to generate adequate end use opportunities for finished compost	• prohibiting disposal of unprocessed waste in landfills, which is simplified if separation of wet wastes practiced, has potential positive effect on waste diversion
IC&I Processing – Dry Wastes • Processing of specific dry materials (e.g. C&D wastes, wood, drywall) in specially designed facilities. • Processing centres for dry recyclables collected from the IC&I sector, owned by the private sector and operated by private sector staff (e.g. Laidlaw MRF, Mississauga or BFI MRF, Concord). • Processing of IC&I sector recyclables in municipal MRF's. • Processing of IC&I sector recyclables by small private sector recyclers • Mandatory processing of all dry wastes prior to landfilling (new policy). • Mandatory processing of all mixed wastes prior to landfilling (new policy).	• processing of dry wastes under System 6 has a positive affect on diversion of dry recyclables • potential diversion of approximately 70%-75% of waste • diversion depends on markets for products: potentially recoverable materials often sent to landfill when market not strong • diversion at processing stage depends on contamination of dry recyclables potentially greater under System 6 than under previous systems due to mixed collection of at least some wastes • also some limitations in processing mixed plastics and other multi-material items	• continue/extend promotion of source separation • development of markets for dry waste materials	• processing of dry wastes under System 6 has a potentially positive effect on waste diversion

IC&I No Unprocessed Waste To Landfill System: Performance (cont'd)

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Processing – Wet Wastes • Centralized windrow composting of source separated IC&I organics (e.g. Scotts Farm) • On-site composting of source separated organics generated by the IC&I sector • Centralized composting of IC&I organics in in-vessel system • Vermicomposting at some IC&I locations • Rendering of food wastes from IC&I sector • New composting facility for IC&I organics • Composting of IC&I organics in municipal in-vessel system	• prohibiting disposal of unprocessed waste in landfills, which is easier if separation of wet wastes occurs, potentially results in significant diversion from landfill • estimated diversion of wet organics is approximately 5.8% of waste • this provides for a total diversion under system 6 between 75%-80% of waste • not all IC&I wet wastes are compostable or suitable for other uses due to contaminant materials - success depends on effective source separation of organics required to ensure marketability • Contamination of wet organics may be greater under System 6 than under System 5 due to mixed collection • Market development required to lower costs and ensure maximum diversion • increased processing capacity likely required though existing planned expansion may be sufficient	• education/promotion of effective source separation of organics to ensure marketability • active market development • requires careful management of processing facilities to minimize operational problems • site facilities away from residential areas	• prohibiting disposal of unprocessed waste in landfills, is helped by separation of wet wastes, and has potential positive effect on waste diversion

IC&I No Unprocessed Waste To Landfill System, Performance (cont'd)

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
<u>IC&I Reuse</u> • Reuse by IC&I generators, through the Canadian, Provincial (e.g. Ontario Waste Exchange) and local waste exchange programs (e.g. Durham). • Community-based reuse programs for small IC&I generators (WASTEWISE, Halton). • Use of food wastes as animal feed. • Use of food waste for human consumption. • Landspreading of IC&I organics • Use of refillable containers (refillable bottles, refillable pails or drums, etc). • Use of re-usable packaging (e.g. reusable plastic and wood pallets, etc.).	• no additional effect noted	• no additional requirements	• no additional effect noted
<u>IC&I Reduction</u> • voluntary waste reduction actions by small IC&I generators. • Voluntary reduction of packaging waste by 25% by the year 2000 (NAPP). • Mandatory development of waste reduction action plans by most IC&I generators (revision to 3Rs regulations). • Mandatory development of packaging reduction action plans by major packaging generators (defined in 3Rs regulations).	• no additional effect noted	• no additional requirements	• no additional effect noted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
IC&I Programs • Voluntary waste audits performed by small IC&I generators • Independent voluntary waste reduction programs in small private companies • Mandatory waste audits by most IC&I generators (revision to 3Rs regulations) • Mandatory packaging audits by major packaging generators (3Rs regulations) • Voluntary packaging reporting by packaging users (NAPP)	• no additional effect noted	• no additional requirements	• no additional effect noted
IC&I Promotion & Education • IC&I information hotline (Metro) • Promotion/education program focused on reducing waste disposed by the IC&I sector, carried out by the regional municipality • Promotion/education of IC&I waste reduction by non-profit organizations (e.g. RCO) • Promotion/education of IC&I waste reduction by associations • Mandatory posting of waste reduction plans for review by employees by most IC&I generators (revision to 3Rs regulations)	• no additional effect noted	• no additional requirements	• no additional effect noted

Schedule Q-7
TABLE 2
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: GTA

SYSTEM: IC&I Existing System

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: **Reliability**			
Indicator: Proven technology	• technology for all components are proven • composting facilities have experienced some operational problems	• IC&I Existing System is considered reliable since it is based on proven technology and relies on the integration of several different approaches	<u>Advantages</u> • proven reliability of mix of handling technologies <u>Disadvantage</u> • composting facilities have experienced some operational problems (eg. odours at compost) which can be mitigated • relies on voluntary source separation in which not all establishments participate

Schedule Q-7
TABLE 2
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: GTA

SYSTEM: IC&I Existing System

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accepted	• Existing System accepts an established range and quantity of recyclable materials that are accommodated in existing facilities • Existing System has capability to respond to limited changes range and quantity of materials	• Existing IC&I System is considered flexible to handle the most easily recyclable materials	<u>Advantages</u> • system can be handle most easily recyclable materials <u>Disadvantages</u> • flexibility limited by reliance on voluntary source separation, recycling and reduction of wastes • limited flexibility to recover more difficult-to-process materials • also limited by lack or weakness of markets for many materials

Schedule Q-7
TABLE 2
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: GTA

SYSTEM: IC&I Existing System

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Performance			
Indicator: Quantity diverted or requiring landfilling	• potentially 25%-32% IC&I waste diversion achieved in GTA (based on 1992 figures)	• estimated waste diversion potential will not meet Ontario targets	<u>Advantages</u> • estimated 25%-32% diversion of waste from landfill • potential increase in voluntary participation through promotion/education <u>Disadvantages</u> • does not meet Ontario targets: nearly 75%-68% of waste continues to be landfilled (some of this likely exported; also, some of that assumed diverted may be exported) • uncertainty in estimates of current level of participation

Schedule Q-7
TABLE 2
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: GTA

SYSTEM: IC&I Existing/Committed System

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Reliability			
Indicator: Proven technology	• technology for all components are proven • composting facilities have experienced some operational problems • success depends on capture of major generators not already participating in recycling activities	• IC&I Existing/Committed System is considered reliable since it is based on proven technology and relies on the integration of several different approaches	<u>Advantages</u> • proven reliability of mix of handling technologies <u>Disadvantage</u> • composting facilities have experienced some operational problems (eg. odours) which can be mitigated • may not capture sufficient number of major generators • relies on voluntary source separation in which not all establishments participate • depends on effective monitoring and follow-up

Schedule Q-7
TABLE 2
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: GTA

SYSTEM: IC&I Existing/Committed System

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accepted	• existing/committed system accepts a range of recyclable materials similar to the existing system as defined in the 3Rs regulations • increase in the quantity of materials depending on the capture of IC&I establishments by the regulations • it is expected that the increase in materials handled can be accommodated in existing facilities • existing/committed system has capability to respond to limited changes in range and quantity of materials	• existing/committed IC&I System is considered flexible to handle the most easily recyclable materials	<u>Advantages</u> • system can be handle most easily recyclable materials • mandatory source separation potentially will increase participation in recycling activities by major waste generators <u>Disadvantages</u> • limited flexibility to recover more difficult-to-process materials • possible limited capture by regulations of major waste generators could limit quantity of materials handled • also limited by lack or weakness of markets for many materials

Schedule Q-7
TABLE 2
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: GTA

SYSTEM: IC&I Existing/Committed System

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Performance			
Indicator: Quantity diverted or requiring landfilling	• potentially 34%-46% IC&I waste diversion achieved in GTA (based on 1992 figures)	• estimated waste diversion potential will not meet Ontario targets	<u>Advantages</u> • estimated potential 34%-46% diversion of waste from landfill • level of voluntary participation may be improved through promotion/education <u>Disadvantages</u> • From 66% to 54% of waste continues to be landfilled (some of this likely exported, also, some of that assumed diverted may be exported) • uncertainty exists in the current levels of voluntary participation • uncertainty in the number of establishments subject to the regulations - refinement of the estimates possible

TABLE 2
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: GTA

SYSTEM: IC&I Extended 3Rs System

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: **Reliability**			
Indicator: Proven technology	• technology for all components are proven • some technical limitations on handling some materials such as, C&D wastes and some plastics - high volume, low density, difficult separation • composting facilities have experienced some operational problems (eg odours) • mandatory source separation regulations designed to capture 90% of range of wastes not proven • success depends on effective design of regulations to capture establishments which generate 90% of waste	• IC&I Extended 3Rs System is considered reliable though less than system 2 • it is based on proven technology for separating most materials with technical limitations for some materials such as C&D wastes and some plastis • regulations designed to ensure source separation of 90% of various materials not proven	<u>Advantages</u> • proven reliability of mix of handling technologies for most easily-recycled materials <u>Disadvantage</u> • composting facilities have experienced some operational problems (eg. odours) which can be mitigated • some technical limitations for some materials such as C&D wastes and some plastics • regulations designed to ensure source separation of 90% of various materials not proven • depends on effective monitoring and follow-up

Schedule Q-7
TABLE 2
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: GTA

SYSTEM: IC&I Extended 3Rs System

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accepted	• system 3 extends the range of materials required to be source separated by certain sectors • increases the quantity of materials handled by extending the number of establishments captured by the regulations • it is expected that the increase in materials handled would require and expansion of private and public sector collection and processing capacity • limitations on identification and separation of materials such as plastics • lack or weakness of markets for some materials, particularly plastics, affects recovery and diversion of these materials	• extended 3Rs system is considered more flexible as it is designed to extend the range and quantity of materials separated from various sectors • expansion of handling capacity is likely required • technical limitations and market limitations become more significant and limit the extent to which the system can reliably handle the range and quantity of materials	Advantages • system can be handle most easily recyclable materials • extension of mandatory source separation to greater number of establishments potentially will increase participation in recycling activities and increase the quantity of all materials handled • some sectors mandated to separate a greater range of materials Disadvantages • more difficult-to-process materials included in regulations bring technical and market limitations - greater amount of plastics

TABLE 2

SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: GTA

SYSTEM: IC&I Extended 3Rs System

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Performance			
Indicator: Quantity diverted or requiring landfilling	• potentially 53%-58% IC&I waste diversion achieved in GTA (based on 1992 figures)	• estimated waste diversion potential will meet Ontario targets	Advantages • estimated potential 53%-58% diversion of waste from landfill • captures significant quantities of materials by including sectors which generate significant quantrities of those materials, and by including greater number of establishments Disadvantages • from 47% to 42% of waste continues to be landfilled (some of this likely exported; also, some of that assumed diverted may be exported) • success depends on effective design of regulations

Schedule Q-7
TABLE 2
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: GTA

SYSTEM: IC&I Expanded 3Rs System

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Reliability			
Indicator: Proven technology	• technology for all components are proven • technology can handle collection/separation mixed papers but some technical limitations on reprocessing boxboard and thus, weak market • some technical limitations on handling some materials such as, C&D wastes and some plastics - high volume, low density, difficult separation • composting facilities have experienced some operational problems • mandatory source separation regulations designed to capture 90% of range of wastes not proven • success depends on effective design of regulations to capture establishments which generate 90% of waste	• IC&I Expanded 3Rs System is considered reliable • it is based on proven technology for separating most materials with technical limitations for some materials such as C&D wastes and some plastis and boxboard • regulations designed to ensure source separation of 90% of various materials not proven	Advantages • proven reliability of mix of handling technologies for most easily-recycled materials Disadvantage • composting facilities have experienced some operational problems (eg. odours) which can be mitigated • some technical limitations for some materials such as C&D wastes and some plastics and fibres such as boxboard • regulations designed to ensure source separation of 90% of various materials not proven

Schedule Q-7
TABLE 2
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: GTA

SYSTEM: IC&I Expanded 3Rs System

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accepted	• system 4 expands the range of materials required to be source separated by certain sectors - extends long list in proposed 3Rs regs to all sectors and adds mixed paper to the list • increases the quantity of materials handled by extending the number of establishments captured by the regulations • it is expected that the increase in materials handled would require and expansion of private and public sector collection and processing capacity beyond that required for system 2 • limitations on identification and separation of materials such as plastics • lack or weakness of markets for some materials, particularly plastics and boxboard, affects recovery and diversion of these materials	• expanded 3Rs system is considered more flexible as it is designed to expand the range and quantity of materials separated from all sectors • expansion of handling capacity is likely required • technical limitations and market limitations for some materials become more significant and limit the extent to which the system can reliably handle the range and quantity of materials	Advantages • system can be handle most easily recyclable materials • extension of mandatory source separation to greater number of establishments potentially will increase participation in recycling activities and increase the quantity of all materials handled • all sectors mandated to separate a greater range of materials Disadvantages • more difficult-to-process materials included in regulations bring technical and market limitations - greater amount of plastics and fibres such as boxboard

Schedule Q-7
TABLE 2
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: GTA

SYSTEM: IC&I Expanded 3Rs System

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Performance			
Indicator: Quantity diverted or requiring landfilling	• potentially 61%-67% IC&I waste diversion achieved in GTA (based on 1992 figures)	• estimated waste diversion potential will meet Ontario targets	Advantages • estimated potential 61%-67% diversion of waste from landfill • potentially captures virtually entire range of materials for recycling Disadvantages • success depends on effective design of regulations

Schedule Q-7
TABLE 2
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: GTA

SYSTEM: IC&I Expanded 3Rs with Organics System

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Reliability			
Indicator: Proven technology	• technology for all components are proven as per System 4 • collection and storage of wet wastes may be a problem for many establishments • effective source separation of wet wastes particularly food is required to ensure product quality and marketability and thus, diversion • composting facilities have experienced some operational problems e.g. odour and product quality - these can be mitigated • regulations designed to capture 90% of wet organics for diversion are not proven • organics processing capacity such as composting will have to increase to handle source separated food and yard wastes	• IC&I Expanded 3Rs System with Organics is considered reliable though less than system 3 and 4 • regulations designed to ensure source separation of 90% of food and yard waste as well as other materials not proven • many small organic waste generators may find collection and storage difficult	Advantages • proven reliability of mix of handling technologies for most easily-recycled materials • proven technology for processing wet organics to achieve mass and volume reduction and diversion when markets available Disadvantages • composting facilities have experienced some operational problems (eg. odours) which can be mitigated • potential problems of collection and storage for some generators of wet organic wastes particularly smaller generators of food wastes • effective source separation essential for marketability of product • depends on effective monitoring and follow-up

Schedule Q-7
TABLE 2
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: GTA

SYSTEM: IC&I Expanded 3Rs with Organics System

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accepted	• as per System 4 but System 5 extends mandatory separation of of wet organics - food and yard wastes to the major geneators of food and yard waste to capture 90% of these wastes • it is expected that an increase in wet organics processing capacity e.g. composting would be required	• System 5 is considered more flexible as it is designed to capture 90% of the food and yard waste in the IC&I sector and to process it in a variety of ways • an expansion of handling and processing capacity is likely required	Advantages • System 5 includes food and yard waste, a significant fraction of the IC&I waste stream (roughly 7.5%) for source separation potentially increasing diversion Disadvantages • effective source separation of wet organics essential to ensure product quality and marketability

Schedule Q-7
TABLE 2
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: GTA

SYSTEM: IC&I Expanded 3Rs with Organics System

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: **Performance**			
Indicator: Quantity diverted or requiring landfilling	• potentially 68%-73% IC&I waste diversion achieved in GTA (based on 1992 figures) • diversion greatly enhanced by effective source separation to meet market quality specifications	• estimated waste diversion potential will meet Ontario targets	Advantages • estimated potential 68%-73% diversion of waste from landfill • includes food and yard waste which account for a significant portion of the waste stream • both mass/volume reduction (composting) possible as well as possible diversion of organic wastes Disadvantages • likely present difficulties for many small establishments • success depends on effective design of regulations

Schedule Q-7
TABLE 2
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: GTA

SYSTEM: IC&I No Unprocessed Waste to Landfill System

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Reliability			
Indicator: Proven technology	• technology for all components are proven • programs ranging from extensive source separation to a two-bin wet and dry mixed waste processing likley response • effective source separation of wet wastes is required to reduce contamination to ensure marketability of recoverables • contamination may be greater in mixed waste streams • composting facilities have experienced some operational problems - these can be mitigated • processing of mixed waste streams often relies on sophisticated equipment - expensive and subject to breakdown • technical limitations on separation of some materials from mixed waste streams particularly plastics • source separation can enhance processing but identification and separation problems persist in mixed plastics streams • possible disposal of a percentage of contaminated recyclables	• System 6 is considered reliable though less than other systems • range of programs including source separation and mixed waste handling likely response - uncertainty in likely response • technical limitations on handling some materials • possible disposal of a percentage of contaminated recyclables, stockpiling of particular materials depending on market conditions • success depends on effectiveness of flow controls	Advantages • proven reliability of mix of handling technologies for most easily-recycled materials • technology exists in GTA to handle mixed waste streams offering increased options for handling wastes • proven technology for processing wet organics to achieve mass and volume reduction and diversion when markets available Disadvantages • experience has demonstrated some operational problems in processing (eg odours at compost facilities) which can be mitigated • potential problems of collection and storage for some generators of wet organic wastes • possible increased contamination of materials in mixed waste handling option • waste flow controls may be difficult to enforce • focussing on "processing" of waste rather than explicitly requiring source separation of specific materials potentially reduces emphasis on need for market development

Schedule Q-7
TABLE 2
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: GTA

SYSTEM: IC&I No Unprocessed Waste to Landfill System

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Flexibility			
Indicator: Types and range of quantities of waste accepted	• increased coverage of waste generators potentially increases quantity and range of materials available for recovery • technical limitations on recovery of certain materials • subject to stockpiling of particular materials depending on market conditions • range of materials collected and processed by private sector will depend on availability of markets - markets for some material not well-developed (e.g. boxboard, many plastics and glass) • increased dry waste processing capacity likely required • organics processing capacity such as composting will have to increase to handle source separated food and yard wastes	• System 6 is considered more flexible as it is designed to capture wastes from all IC&I waste generators • range of materials collected, processed and recovered by private sector will depend on availability of markets - markets for some material not well-developed (e.g. boxboard, many plastics and glass) • an expansion of handling and processing capacity is likely required	Advantages • System 6 increases number of establishments required to participate in 3Rs potentially making available greater quantity and range of materials for recovery Disadvantages • option of mixed waste handling may reduce effective separation and recovery

Schedule Q-7
TABLE 2
SYSTEM NET EFFECTS TABLE

REGIONAL MUNICIPALITY: GTA

SYSTEM: IC&I No Unprocessed Waste to Landfill System

Criteria/Indicator	System Net Effects by Indicator	System Net Effects by Criterion	Advantages/Disadvantages by Criterion
Criterion: Performance			
Indicator: Quantity diverted or requiring landfilling	• potentially 75%-80% IC&I waste diversion achieved in GTA (based on 1992 figures)	• estimated waste diversion potential will meet Ontario targets	Advantages • estimated potential 75%-80% diversion of waste from landfill • captures widest range and quantity of material for possible recycling • range of options likely available for individual establishments to deal with wastes Disadvantages • focussing on "processing" of waste rather than explicitly requiring source separation of specific materials potentially reduces emphasis on need for market development

Schedule Q-5

TABLE 1 – IC&I SYSTEM 5

EXPANDED 3Rs REGULATIONS WITH ORGANICS

GENERIC SYSTEM NET EFFECTS TABLE BY COMPONENT

SYSTEM: IC&I Expanded 3Rs with Organics System
CRITERIA GROUP: Service
CRITERIA: Performance
INDICATOR: Quantity Diverted

Component Category/ Components	**Component Effects**	**Mitigation/ Enhancement**	**Component Net Effects**
IC&I Collection – Dry Wastes • Voluntary source separation of dry recyclables by small IC&I generators. • Collection of source separated dry recyclables from the IC&I sector by private sector haulers and recyclers. • Curbside collection of IC&I recyclables in some areas by municipal forces. • IC&I depots at transfer stations for use by small business generators • Landfill bans on specified materials (e.g. wood, tires, drywall, scrap metal, white goods, fine paper etc.). • Mandatory source separation of designated materials by most generators (revision to 3Rs regulations).	• no additional effect noted	• no additional requirements	• no additional effect noted

Component Category/ Components	Component Effects	Mitigation/ Enhancement	Component Net Effects
<u>IC&I Collection – Wet Wastes</u> • Mandatory source separation of wet wastes by designed IC&I generators (revision to 3Rs regulations). • Voluntary source separation of IC&I generated organics. • Separate collection of IC&I wet wastes	• expanding mandatory separation of wet organics (food and yard waste) potentially results in significant diversion from landfill • estimated diversion is 6.6% of IC&I waste • this provides for a total diversion of up to 70% of IC&I waste • success depends on effective design of regulations of identify and regulate establishments which generate most (90%) of the IC&I food and yard waste • success also depends on effective source separation of these wastes to ensure marketability • increased collection capacity for wet wastes is likely required	• education/promotion of effective source separation of organics to ensure marketability • active market development to ensure end uses for finished product	• mandatory source separation and collection of wet organics has potential positive effect on waste diversion
<u>IC&I Processing – Dry Wastes</u> • Processing of specific dry materials (e.g. C&D wastes, wood, drywall) in specially designed facilities. • Processing centres for dry recyclables collected from the IC&I sector, owned by the private sector and operated by private sector staff (e.g. Laidlaw MRF, Mississauga or BFI MRF, Concord). • Processing of IC&I sector recyclables in municipal MRFs. • Processing of IC&I sector recyclables by small private sector recyclers. • Additional processing capacity for dry recyclables.	• no additional effect noted	• no additional requirements	• no additional effect noted